

# The Multibus<sup>\*</sup> Buyers Guide

*"... we make the vital connection"*

Volume 2 Number 1  
March 1983

A directory of  
Multibus compatible  
micro computer  
products

- Single Board Computers
- Dynamic RAM
- Static RAM
- RAM/ROM
- CRT Controllers
- Analog Input/output
- Serial I/O Expansion
- Peripheral Controllers

Model Numbers •  
Prices • Specifications •  
Special Features

Current, Complete  
Vendor Data

Sales Office  
Locations

New Products



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(619) 450-0191

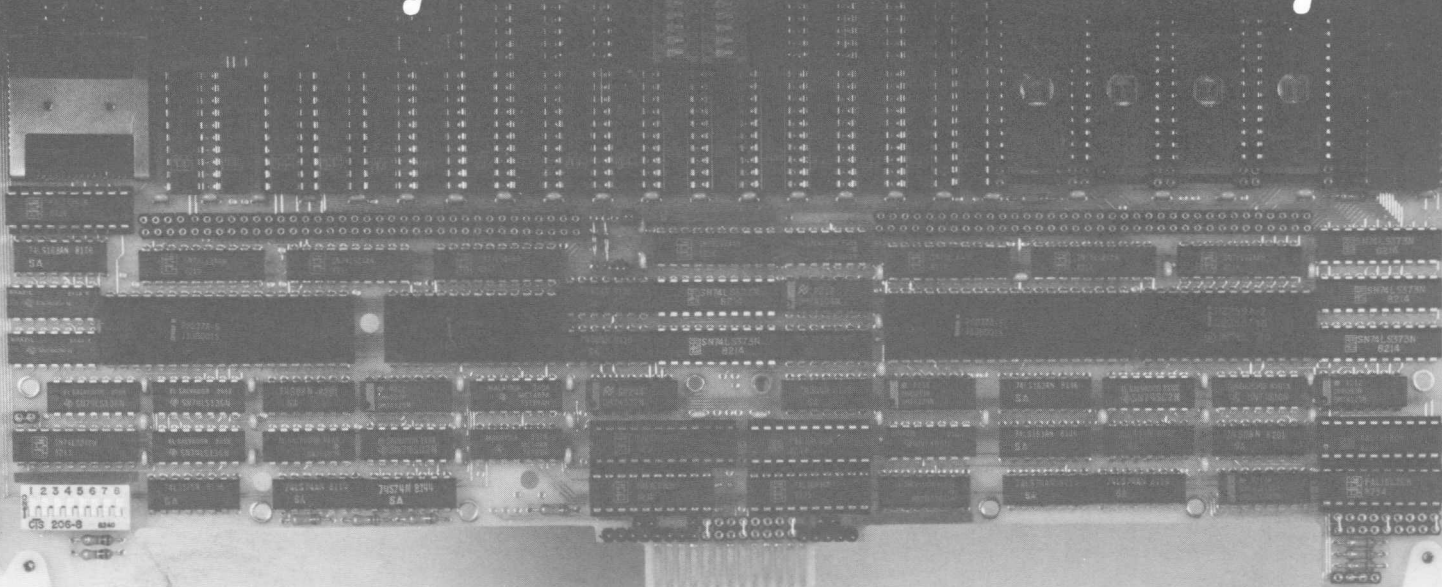
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service for Multibus  
microcomputer  
systems

\$35<sup>00</sup> per copy

**Spring '83**

# MPA-2000 Intelligent I/O Controller

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### Serial I/O

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- SDLC/HDLC
- X.25

### Disk I/O

- SASI Interface
- Winchester Disk
- Floppy Disk

### Parallel I/O

- Bus-to-Bus
- Intelligent Link
- Data Acquisition

### Local Area Network

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  - Full 16M address, Multimaster capability
  - 64K EPROM
  - 128K RAM with parity (64K can be dual-ported)
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  - Flexible interrupt structure
  - Serial I/O Monitor/Debug Port
- EIGHT PROGRAMMABLE DMA CHANNELS
- LOW PROFILE PLUG-IN MODULES
  - Field interchangeable
  - Modules for Serial I/O, Disk, Parallel I/O
  - Custom modules easily designed
  - Serviced by DMA channels
  - Can be configured as iSBX\* module sites
- STANDARD MULTIBUS INTERFACE
  - Single unit load
  - Single cardslot height (even with plug-in modules)
- UNIQUE MetaPaket™ ARCHITECTURE
  - High speed hardware/firmware technique allows message transfer between intelligent devices
  - Shared memory not required



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7290 Engineer Rd., Suite F • San Diego, CA 92111  
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The Multibus Buyers Guide is a semi-annual publication listing all the Multibus compatible products currently available. The main purpose is to provide system designers, O.E.M. integrators and manufacturers a time saving method of surveying an entire market that is rapidly changing. Over 100 new Multibus products have been introduced in just the last six months along with the appearance of many (about 40) new venders.


Our first priority is to list all the products and who manufactures them. The second priority is to seek out and consolidate important specifications and present them in a summerized easy-to-read format. To do this we are directly in contact with over 160 Multibus manufacturers on a daily basis.

".....we make the vital connection"

This compendium is intended as a guide only, prospective buyers are urged to contact the manufacturers, or their sales offices regarding any products of interest.

It is our hope that The Multibus Buyers Guide helps you keep abreast of the rapidly expanding world of Multibus-compatible products.

Sincerely,

  
FRED MAZANEC  
Publisher

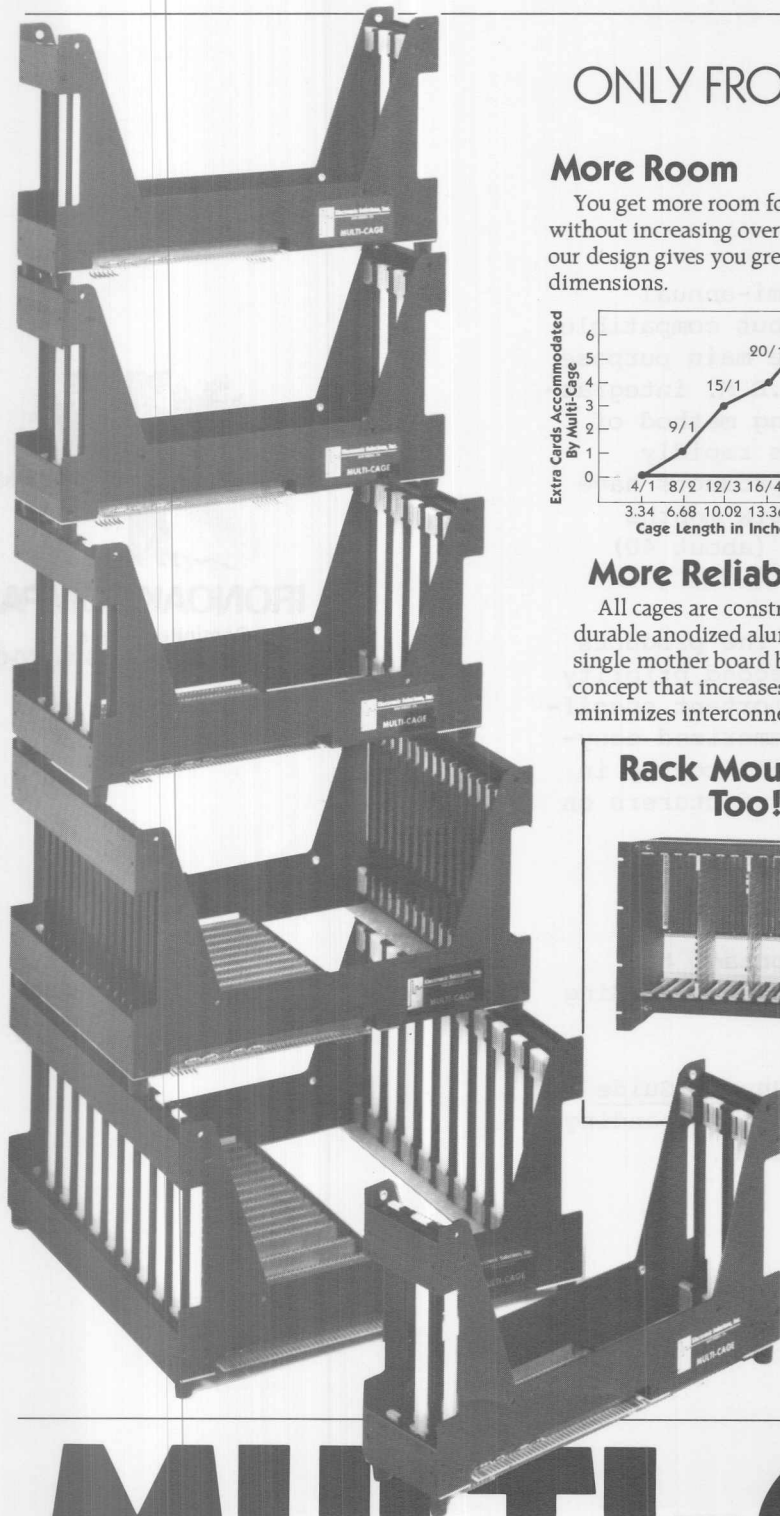
1. Internal
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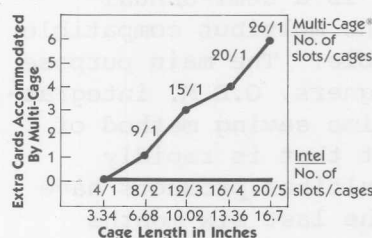
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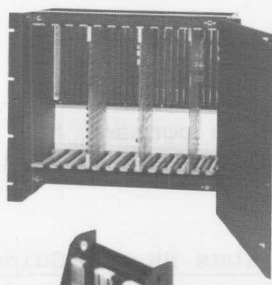
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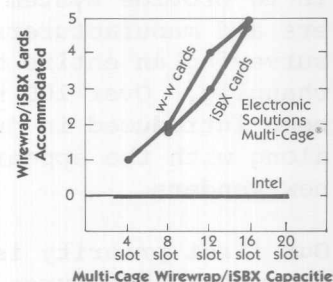
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# MULTI-CAGE®

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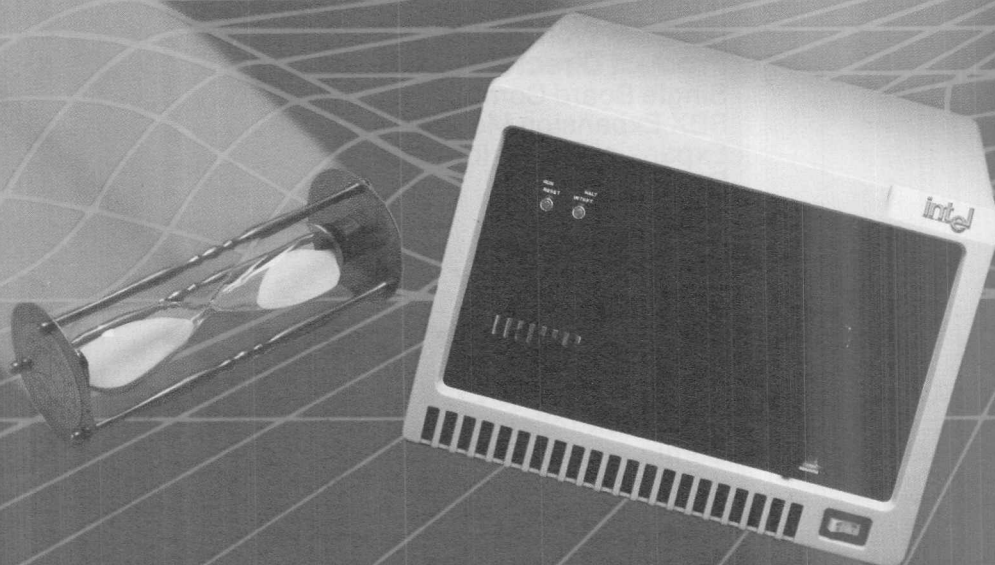
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# The Multibus<sup>®</sup> Buyers Guide

## PRODUCT DIRECTORY...

The purpose of the PRODUCT DIRECTORY is to categorically list all Multibus compatible board-level products by manufacturer and model number. The listed price is quantity one, enduser, and subject to change without notice. The date first available (DFA) is shown where possible, to indicate relative newness of a product. Delivery times are also subject to change without notice.

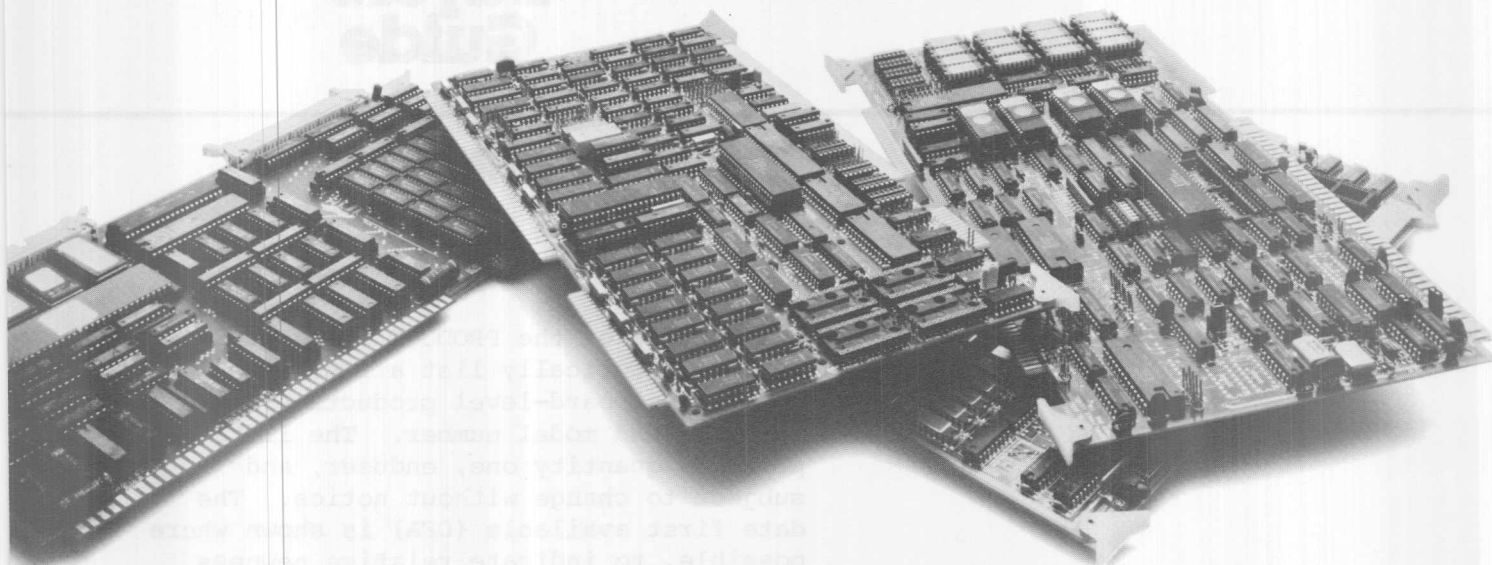
We urge you to contact the manufacturer directly or their local sales office regarding any products of interest. To facilitate this, we have included the manufacturers phone number next to each product listing and a MANUFACTURERS SALES OFFICE DIRECTORY.

### legend

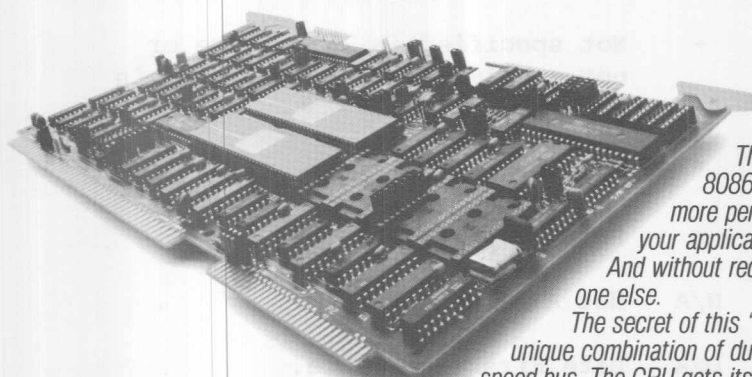
- ★ New Product- introduced within the last six months.
- Not specified in literature or not available or unclear at this writing.
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- o Parameter is included.
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# FAST.



# FAST AND A HALF.



That's the kind of performance you can expect from Microbar's 8086- or MC68000-based Dual Bus™ Computers. Up to 50% more performance in your Multibus\* system, depending upon your application. Without sacrificing Multibus compatibility. And without requiring on-board memory that's off-limits to everyone else.

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To help you get the most out of your design efforts, Microbar has developed a Dual Bus Computer design kit. With all the information you need to add a Dual Bus Computer to your system. In a hurry. Because today designing a system fast is not enough. You have to be fast and a half.



Microbar Systems Inc./1120 San Antonio Road/Palo Alto, California 94303/(415) 964-2862

I want to design in fast and a half performance. Fast. Here's \$9.95. Rush me the Dual Bus™ Computer design kit, including manuals and technical specs, for the CPU indicated below. Also include the latest copy of the IEEE P796 specifications for the Multibus bus.

8086 \_\_\_\_\_ MC68000 \_\_\_\_\_

Check enclosed \_\_\_\_\_ MC \_\_\_\_\_

VISA Card \_\_\_\_\_ Exp. Date \_\_\_\_\_

I can't wait for the mail. Have a sales representative contact me.

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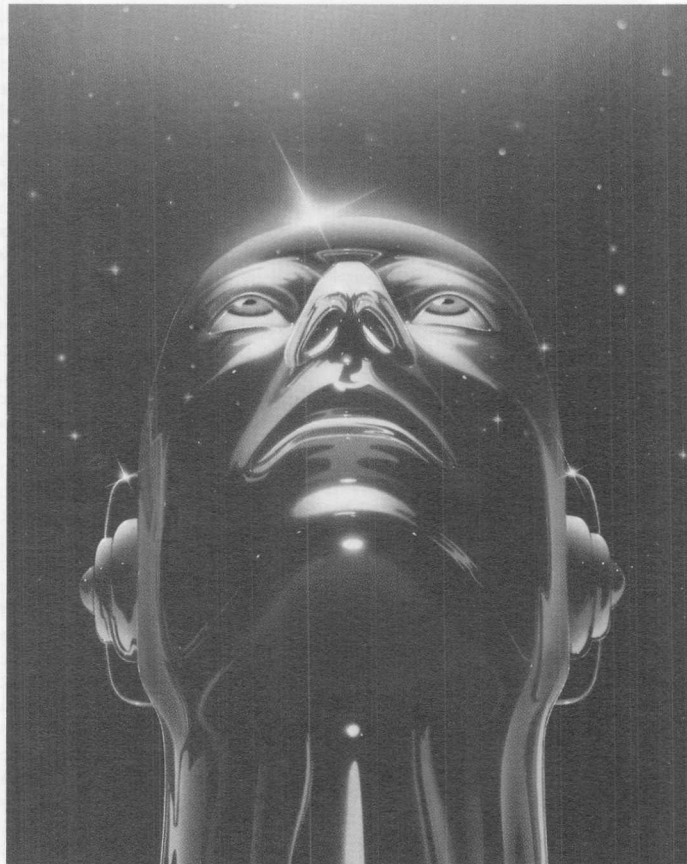
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## Single Board Computers

Advanced Micro Devices  
Advant MicroSupport  
AIM Technology  
Bridge Communications, Inc.  
Bubbl-tec  
Central Data Corporation  
Century Data Corporation  
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Codata Systems Corp.  
Comark Corporation  
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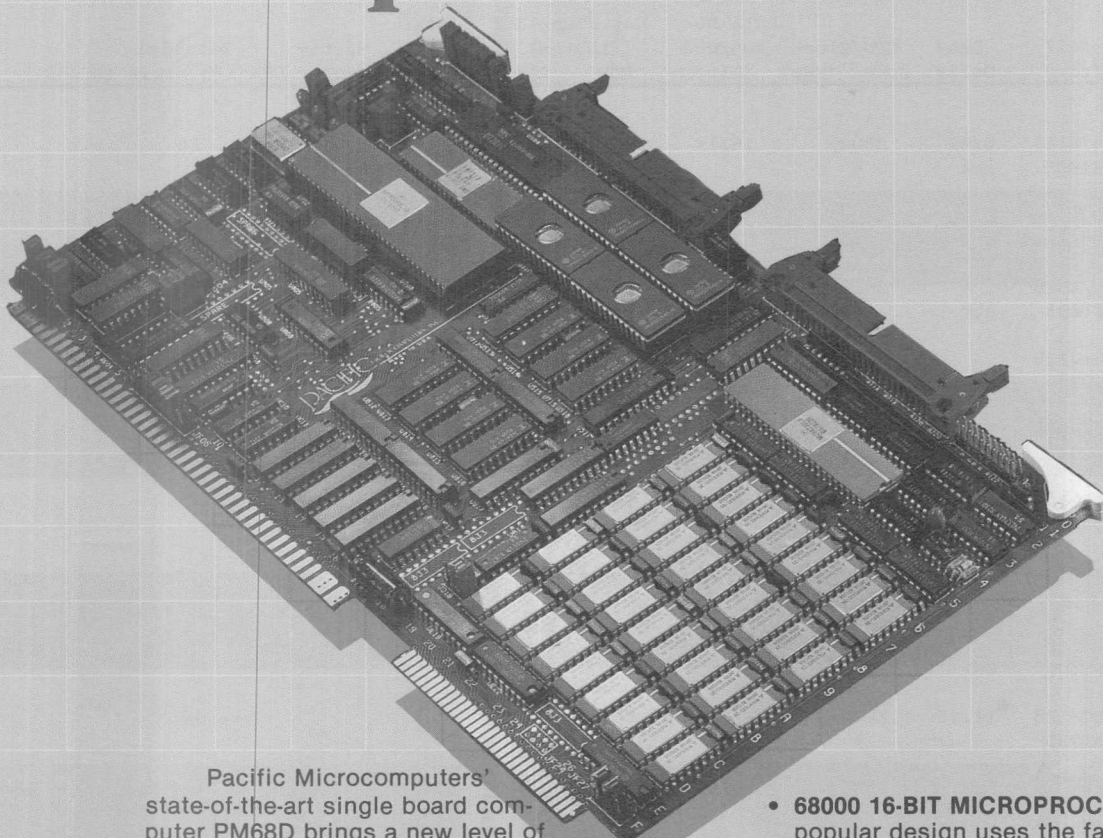


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**Pacific Microcomputers' PM68D.** State-of-the-art performance. State-of-the-art price.

For more information call 619-436-8649.

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## Single Board Computers

Manufacturer	Model/ Price	DFA/ Deliv.	CPU/Clock Speed (MHz)	Data Bus/ Address (bits)	Cap./Supplied (Kbytes) ROM RAM	Total Add. (bytes)	Multi- master	Parallel DMA	I/O Lines	(RS232)
AMD .....	96/4116 \$1995	6/82 stk	Z8002 4	16/19	8/- 32/32	512K	o	-	24	2
(408) 988-7777										
	95/4010 \$995	8/80 stk	8085A 4	8/*	4/- -/-	1M	o	-	24	2
	96/4018 \$1695	- stk	Z8001/2 4	-/-	16/- 8/-	4M	-	-	24	2
	96/4126 \$2245	stk	Z8002 4	16/19	8/- 128/128	512K	o	-	24	2
	97/8605 \$1775	-	8086 -		64/- 8/8	-	-	-	24	2
Advant Corp. ....	MS7100 \$-	*10/82 -	68000 8	16/24	16/16 2/2	16M	o	o	-	2
(408) 730-5255										
AIM Technology .....	68000CPU \$2500	5/82	68000 8	16/24	16/16 2/2	16M	o	o	-	2
(408) 727-3711										
Bridge Communications, Inc..	MCPU \$2500	*12/82 6wk	68000 10	16/24	32/- 384/256	16M	o	o	o	2
(408) 446-2981										
Bubbl-Tec .....	BBC-128 \$1795	*11/82	Z80A 4	-/-	64/- 64/-	-	-	-	16	2
(415) 829-8700										
Central Data Corp. ....	B1017 \$710	6/80 stk	Z8001 4	16/24	4/- 0/0	16M	o	o	o	-
(217) 359-8010										
Century Computer .....	V-800 \$2000	9/82	8088/85 5	16/20	16/- 64/-	128K	-	o	o	1
Christian Rovsing Corp. ....	MPMP \$-	-	8088 -	8/20	64/- 128/-	-	-	-	o	2
(805) 497-6722										
Codata Systems Corp. ....	68000CPU \$2450	4/81 -	68000 8	16/24	32/2 256/256	256K	o	o	16	2
Comark Corporation .....	MC85 \$895	1/80	8085 5	8/16	16/- 6/6	64K	o	-	48	1
(716) 894-7000										
	MC86 \$2995	*12/82	8086 10	16/24	64/32 128/128	16M	o	-	24	1
Cosmos Systems, Inc. ....	CMT-CPU \$2850	3/82 -	68000 8	16/24	16/- 64/64	16M	o	o	16	2
	CMT-SBC \$-	-	68000 10	16/24	32/- 256/-	16M	o	o	16	2

Counter Timers (No./bits)	Interrupt Levels/ Sources	+5V Only	SBX Conn.	Distinguishing Features
5/16	10/23	-	-	4.0 MHz AmZ8002 CPU with 32 Kbytes of dual ported RAM, two Am9551 serial ports, one Am8255A parallel I/O chip, an Am9513 timer, and an 8259A interrupt controller.
5/16	8/-	-	-	4 MHz Am8085A MPU with programmable memory management unit. 1 Mbyte addressing space is mappable as 256 1K segments.
3/16	-/-	-	-	Complete evaluation package for the AmZ8001 and AmZ8002 with a ROM-based monitor and line-by-line assembler/disassembler.
5/16	10/23	-	-	5-bit memory page register, two 24/28 Eprom sockets.
-/-	-/-	-	3	On-board 8087 math co-processor, 4 PROM sockets.
3/16	7/19	o	-	Optional FP processor. On board MMU easily accomodates multi-tasking operating system. On-board diagnostics and maintenance port do not require bus for operation.
3/16	7/19	o	-	Not SBC but SuperMicro Computer element with Mini computer architecture: Optimized "OS" derived from Bell Laboratories UNIX System 3. Advanced MMU and scattered page loading. On-board diagnostics and maintenance port accessible.
5/16	8/1	-	1	68000 based, 10 MHz, no-wait states, very high performance and large RAM area.
4/-	-/-	-	-	Complete general-purpose microcomputer with on-board magnetic-bubble memory for non-volatile storage of programs and data. Runs CP/M or other operating system from on-board bubble. Z-80A processor.
3/16	10/13	o		Memory divided into 2K pages mapped onto addresses by the on-board circuitry. Optional Am9511 APU.
3/16	0/0	-	o	
-/-	-/-	-	3	Optional 8087 math co-processor, on-board floppy disk interfaces for up to 4 floppies.
-/-	7/-	o	-	
3/16	12/-	-	-	
3/16	12/-	-	2	MS-DOS or CP/M86 in Prom included. Paging register supports 16MB RAM. DISKRAM software available for 8MB of superfast "silicon disk." 9211A math option. Centronics Port standard.
0/0	7/-	-	-	
3/16	7/-	-	1	

continued next page



## Single Board Computers

Manufacturer	Model/ Price	DFA/ Deliv.	CPU/Clock Speed (MHz)	Data Bus/ Address (bits)	Cap./Supplied (Kbytes) ROM RAM	Total Add. (bytes)	Multi- master	Parallel DMA	I/O Lines (RS232)
Cyb Systems, Inc. (512)458-3224	CPU 68000 \$2990	9/82	68000 8	-/-	-/- -/-	-	o	-	2
Densan Co., Ltd.	DSB-86/12A \$-	-	8086 5	16/-	32/- 128/32	-	-	-	24
Distributed Computer (800)225-4589 (617)899-6619	DCS 8010A \$500	-	8080 2	8/16	32/* 4/*	64K	o	o	48
	DCS 86/16 \$1200	-	8086 -	16/20	24/- 12/2	1M	o	o	24
Diversified Technology (601)856-4121	CBC800/216 \$1475	8/80	NSC 800 2.5	8/16	32/- 16/16	64K	o	-	44
Edge Micro Systems	B86-CPU-X \$790	-/82	8086 5	16/20	8/- -/-	-	-	-	o
Eirich Machines, Inc.	EMCON 601 \$1280	7/82	8085A 3	8/16	64/- 64/-	64K	-	-	24
EMM/Sesco	SECS 86/05 \$6950	-	8086 5	-/-	64/- 64/8	1M	o	-	24
	SECS 88/25 \$8950	-	8088 5	-/-	64/- 64/8	1M	o	-	24
	SECS 80/10A \$2850	-	8080A 2	-/-	8/- 1/1	65K	-	-	48
ETI Micro (415)829-6600	8108 \$965	11/81	8085/88 3 or 5	8/16 8/20*	6/6 1/1	64K 1M*	o	-	12
Fairchild/Schlumberger (408)773-2101	F68-PEP \$890	-	6802/6808 1 or 2	8/*	32/0 8/8	65K	o	-	16
	PEP-45 \$1765	6/82 6 mo	F9445 16,20 or 24	16/16	32/4 8/8	65K	-	-	16
Forward Technology, Inc.	FT-68M \$2621	81	68000 8	16/24	32/- 256/256	1.5M	o	-	16
	FT-68X \$2996	82	68000 10	16/24	64/- 256/256		o	o	16



Counter Timers (No./bits)	Interrupt Levels/ Sources	+5V Only	SBX Conn.	Distinguishing Features
-/-	-/-	-	-	Has Motorola's 8MHz MC68000, up to 512 Kbytes of on-board memory (with no wait states); two 800K baud serial ports, and segmentation over paging memory management.
3/-	8/-	-	-	Two boards, dual-port.
0/0	1/-	-	-	Two serial ports-industrial and MIL-spec components; superset Intel 8010A.
3/16	9/12	-	-	Three serial ports, HDLC/SDLC capability, RS-422, 55°C "burn in".
3/16	12/20	-	-	Complete CMOS design; under 1W of power dissipation.
3/16	7/-	N/A	-	2 parallel I/O parts, includes DMA floppy controller.
6/16	8/-	N/A	2	Can access up to 64K of off-board memory.
-/-	9/16	-	-	MIL-Spec.
-/-	9/16	-	-	Two board set, ruggedized.
-/-	1/6	-	-	
3/16	8/15	-	-	Co-resident 8085A & 8088 CPU's with boot and monitor for each, battery back-up for calendar clock, hardware math, busmaster capability, 2 priority interrupt controllers.
3/16	1/4	o	-	On-board EPROM programmer.
1/-	5/-	o	-	On-board EPROM programmer.
5/16	7/21	o	-	Offers memory management.
-/-	-/-	o	o	Optional add-on memory 76B and 256 Kbyte.

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## Single Board Computers

Manufacturer	Model/ Price	DFA/ Deliv.	CPU/Clock Speed (MHz)	Data Bus/ Address (bits)	Cap./Supplied (Kbytes) ROM RAM	Total Add. (bytes)	Multi- master	DMA	Parallel I/O Lines	(RS232)
Heurikon Corporation ..... (608) 271-8700 (800) 356-9602	MLZ-90A \$1195	7/80 stk	Z80A 4	8/20	72/- 16/16	1M	o	o	322	2
	MLZ-91A \$1895	5/81 stk	Z80A 4	8/20	16/- 64/64	1M	o	o	8*	2
	MLZ-92A \$1895	11/81 30 da	Z80A 4	8/20	16/- 64/64	1M	o	o	8*	4
	MLZ-93A \$2195	1/82 30 da	Z80A 2or4	8/16	32/- 128/128	16M	o	o	16	3
	HK-68A \$3895	9/82	68000 8	16/24	64/- 256/256	16M	o	o	16*	2
Intel Corporation ..... See Sales Office Listing	iSBC 86/30 \$2990	- -	8086-2 5or8	16/20	64/0 256/128	1M	o	o	24	1
	iSBC286/10	* -	80286 8	16/24	256/0 80/0	16M	o	o	12	2
	iSBC 86/14 \$2290	- -	8086-2 5or8	16/20	64/0 64/32	1M	o	o	24	1
	iSBC 86/12A \$1900	- -	8086 5	16/20	32/0 64/32	1M	o	o	24	1
	iSBC 86/05 \$1645	- -	8086-2 5or8	16/20	128/0 16/8	1M	o	o	24	1
	iSBC 88/40 \$2000	- -	8088 5	8/20	128/0 8/4	1M	o	-	24	iSBX 351
	iSBC 88/25 \$790	- -	8088 5	8/20	128/0 16/4	1M	o	o	24	1
	iSBC 80/30 \$1565	- -	8085A 2.76	8/16	8/0 16/16	64K	o	o	24 24*	1 2*
	iSBC 80/24 \$945	- -	8085A-2 4.84/2.42	8/16	32/0 8/4	64K	o	o	48	1
	iSBC 80/20-4 \$865	- -	8080A 2.15	8/16	8/0 4/4	64K	o	o	48	1
	iSBC 80/16 \$540	-	8080A	8/16	64/0 32/2	64K	-	o	48	1
	iSBC 80/10B \$540	- -	8080A 2.05	8/16	16/0 4/1	64K	-	o	48	1
	iSBC 80/05 \$435	- -	8085A 1.97	8/16	4/0 .5/.5	64K	o	o	22	1

Counter Timers (No./bits)	Interrupt Levels/ Sources	+5V Only	SBX Conn.	Distinguishing Features
4/16	8/-	-	-	Price includes floppy disk controller; optional: Am9511.
4/16	8/-	-	-	Fully populated, includes parity, Am9511, floppy disk controller, Winchester and streamer interface, IEEE 488 interface, 16 CIP sw positions, RS422/RS423.
4/16	8/-	-	-	Price includes floppy disk controller, hard disk and tape interfaces; optional: Am9511, RS422/RS423.
3/16	8/-	-	-	Price includes floppy disk controller and Am9511.
3/16	8/-	-	o	Memory-mapped I/O; MC68451 MMU; Winchester interface; streaming tape interface.
3/16	9/28	-	2	iSBC 304 Multimodule provides 128 Kbytes of dual-port RAM expansion, \$1250.
3/16	16/23	-	2	iSBC 341 provides 4 universal memory site expansion, 80287 numeric processor socket provided.
3/16	9/28	-	2	iSBC 300A Multimodule provides 32 Kbytes of dual-port RAM expansion, \$750.
3/16	9/18	-	-	iSBC 303 Multimodule add-on parity.
3/16	9/24	-	2	Optional iAPX 86/20 numeric data processor with iSBC 337 Multimodule processor board.
3/16	9/26	-	3	Multimaster or intelligent slave, 12-bit 20 KHz A/D with PGA, 16 diff. or 32 SE. On-board programming of 2816 E <sup>2</sup> Proms, optional 8087.
3/16	9/24	-	2	
3/16	12/18	-	-	
3/16	12/23	-	2	
3/16	8/26	-	-	
1/-	1/12	-	2	Limited Master.
1/-	1/11	-	1	Limited Master.
1/14	4	o	-	

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## Single Board Computers

Manufacturer	Model/ Price	DFA/ Deliv.	CPU/Clock Speed (MHz)	Data Bus/ Address (bits)	Cap./Supplied (Kbytes) ROM RAM	Total Add. (bytes)	Multi- master	DMA	Parallel I/O Lines	(RS232) Ports
Logitech, Inc. .... (415) 326-3885	PY8610 \$1490	9/82 2wk	8086 5,8	8-16/24	32/8 128/128	16M	o	o	8	1
Matrox Electronic Systems . (514) 735-1182	ZBC-80 \$1045	- -	Z80A 4	8-16/	40/- 64/16	64K	o	o	48	1
	PBC-80 \$1365	- -	Z80A 4	8-16/16	128/- 64/-	16M	o	-	24	2
	MBC-86/12 \$1995	- -	8086 5,8or10	16/20	32/- 128/128	1M	o	o	24	1
MBI, Inc. .... (617) 964-1399	Perfect Slave \$2300	12/81 -	Z80A/B 4,6*	8/16	32/- 256/128	256K	o	o	16	4
	Perfect Slave \$2587	3/82 -	8086 8,10*	8-16/24	32/- 1M/128	16M	o	o	24	4
Metacomp, Inc. .... (619) 571-1168	MPA1000 \$2995	6/83 45 da	iAPX-286 8	16/24	64/- 128/-	16M	o	o	24	2
	MPA2010 \$2995	*3/83 30 da	iAPX-286 8	16/24	64/- 128/-	16M	o	o (8ch.)	o	1
Microbar Systems, Inc. .... (415) 964-2862	GPC86-532 \$1195	2/81 1 wk	8086 5,8*	8-16/20	32/- 128/32	1M	o	-	24	1
	C86-54 \$995	12/80 1 wk	8086 5,8*	8-16/20	32/- 4/4	1M	o	-	-	1
	DBC86-50 \$1225	3/82 1 wk	8086 5,8*	8-16/24	32/- 4/-	16M	o	-	24	2
	DBC68K-80 \$1595	3/82 1 wk	68000	8-16/24	32/- 4/-	16M	o	-	24	2
	DBC286M \$1995	*4/83 30 da	80286 8	8-16/24	32/- 4/-	16M	o	-	24	2
	DBC68K2 \$1995	*4/83 30 da	68000 8*10,12	8-16/24	128/- 512/128	16M	o	o	-	2
	DV286 \$2495	*4/83 30 da	80286	8-16/20	32/- 128/128	1M	o	-	24	1
Micro Industries (614) 895-0404	MIB80/04 \$282	*5/83 stk	8085 2	8/16	4/- 256/-	-	-	-	22	1 (14 TTL)
	MIB80/05 \$500	*5/83 stk	8085 2	8/16	4/- 512/-	-	-	-	22	1 (14 TTL)



# Single Board Computers

Counter Timers (No./bits)	Interrupt Levels/ Sources	+5V Only	SBX Conn.	Distinguishing Features
2/16	8/19	-	2	128 Kbytes of dual-port memory with parity. 8087 add-on, operates without wait states. With LX 350-PIO, user can add 24 programmable I/O lines.
6/16	16/16	-	-	Optional Am9511/Am9512 APU; Operates without wait states.
5/16	16/-	-	2	On-board Memory Management Unit.
3/16	8/8	-	-	128 Kbyte and 64 Kbyte versions available.
4/8	1/8	-	-	Configurable as intelligent slave. APM, Multibus and CPM compatible; dual-port RAM.
8/16	8/8	-	-	Configurable as intelligent slave or service processor. APM, Multibus and CPM compatible. Dual-port RAM. Memory management.
6/-	16/28	o	2	80130 OSF, 128K RAM with Parity (64K Dual-Ported), iAPX-287 Numeric Processor Socket, iAPX-186 processor for MetaPaket architecture to support high speed inter-processor message passing protocol.
6/-	16/28	o	2	80130 OSF, 8 DMA CHANNELS, 128K RAM with Parity (64K DUAL PORTED) extremely flexible architecture allows operation as CPU, intelligent I/O processor or various combinations. MetaPaket architecture.
3/16	8/16	-	-	Optional CPU memory management, MM86; 8087 floating point processor.
-/-	1/11	-	-	Optional CPU memory management, MM86; 8087 floating point processor. 30 sq. in. breadboard area.
3/16	8/12	-	-	Features Dual Bus interface; optional: 8087 and MM86; dual-ported 0.5 Mbyte no wait state RAM card optional.
3/16	18/22	-	-	Dual-ported 0.5 Mbyte RAM card; optional: up to 8 DBR50 cards provide 4 Mbyte of RAM; MMU 68451 optional; supports bus vectored interrupts.
3/16	8/12	-	-	Features Dual Bus interface; opt. 80287; dual port 0.5 Mbyte; 2 wait state RAM cards optional.
3/16	18/22	-	1	Opt. MMU's; SUN Style or 68451; dual lens for 2 Mbytes + high speed dual-port RAM; byte and word reversing control; mailbox int. & reset.
3/16	8/16	-	-	Optional 80287 floating point processor.
-	-	-	-	Single board computer SBC80/04 compatible.
-	-	-	-	Single board computer. See SBC80/05.

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## Single Board Computers

Manufacturer	Model/ Price	DFA/ Deliv.	CPU/Clock Speed (MHz)	Data Bus/ Address (bits)	Cap./Supplied (Kbytes) ROM RAM	Total Add. (bytes)	Multi- master	DMA	Parallel I/O Lines	(RS232) Ports
Midwest Micro-Tek, Inc. ...	PC-85/20M \$445	*10/82 -	8085	8/	32/2 32/2	-	-	-	24	1
	PC-88/12M \$1195	*10/82 -	8088	16/	8/2 64/-	1M	o		22	1
Monolithic Systems Corp. ... (303) 770-7400	MSC 8001-07 \$630	- -	Z80A 4	8/16	16/- 8/4	64K	-	o	48	1
	MSC 8004-12 \$1214	- -	Z80A 4	8/16	32/- 64/32	64K	o	o	48	1
	SC 8007-12 \$1376	- -	Z80A 4	8/16	32/- 64/32	64K	o	o	24	3
	MSC 8009-24 \$1151	- -	Z80A	8/16	32/- 64/32	64K	o	o	-	2
National Semiconductor .... See Sales Office Listing	BLC-86/05 \$1600	- stk	8086-2 5 or 8	16/20	16/8 128/-	1M	o	o	24	1
	BLC-86/12B \$1700	- stk	8086 5	16/20	32/- 64/32	1M	o	o	24	1
	BLC-80/316 \$760	- stk	Z80A 4	8/16	8/- 16/16	64K	o	-	48	1
	BLC-80/05 \$405	- stk	8085A 2	8/16	8/- .5/.5	64K	o	o	22	1
	BLC-80/10 \$448	- stk	8080A 2	8/16	4/- 1/1	64K	-	-	48	1
	BLC-80/11 \$395	- stk	8080A 2	8/16	8/- 1/1	64K	-	-	48	1
	BLC-80/11A \$395	- stk	8080A 2	8/16	32/- 1/1	64K	-	-	48	1
	BLC-80/14 \$465	- stk	8080A 2	8/16	8/- 4/4	64K	-	-	48	1
	BLC-80/14A \$465	- stk	8080A 2	8/16	32/- 4/4	64K	-	-	48	1
	BLC-80/24 \$875	- stk	8085A-2 4.8	8/16	32/- 4/4 8/8*	64K	o	-	48	1
	BLC-80/204 \$750	- stk	8080A 2	8/16	8/- 4/4	64K	o	-	48	1

Counter Timers (No./bits)	Interrupt Levels/ Sources	+5V Only	SBX Conn.	Distinguishing Features
-	-	-	1	Compatible with iSBC 80 family.
1/16	9/-			Socket for 8087 math processor, includes dual-density dial controller.
3/16	8/-	-	-	
3/16	8/-	o	-	Optional, 64 Kbyte version, on-board APU.
3/16	8/-	-	-	Optional, 64 Kbyte version, on-board APU.
3/16	8/-	-	-	Includes on-board floppy disk controller; Optional: Am9511A APU.
3/16	9/24	-	2	Alternate source for iSBC 86/05, 2X Prom space. 12 mo.warranty.
3/16	9/21	-	2	Alternate source for iSBC 86/12, 2BLX connectors, 128K Prom space. 12 mo. warranty.
3/16	9/21	-	-	4MHz Z80 CPV, 12 mo. warranty.
1/14	4/12	o	-	Alternate source for iSBC 80/05, 2X more Prom space & 4K more RAM. 12 mo. warranty.
1/1	1/11	-	-	Alternate source for iSBC 80/10. 12 mo. warranty.
1/1	1/11	-	-	BLC-80/10 with 2X Prom space. 12 mo. warranty.
1/1	1/11	-	2	Alternate source for iSBC-80/10B. 12 mo. warranty.
1/1	1/11	-	-	BLC-80/14 with more RAM. 12 mo. warranty.
1/1	1/11	-	-	BLC-80/11A (iSBC 80/10B) with more RAM. 12 mo. warranty.
3/16	12/23	-	2	Alternate source for iSBC 80/24. 12 mo. warranty.
3/16	8/26	-	-	Alternate source for iSBC 80/20-4. 12 mo. warranty.

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## Single Board Computers

Manufacturer	Model/ Price	DFA/ Deliv.	CPU/Clock Speed (MHz)	Data Bus/ Address (bits)	Cap./Supplied (Kbytes) ROM RAM	Total Add. (bytes)	Multi- master	DMA	Parallel I/O Lines	(RS232) Ports
NEC Electronics U.S.A. .... (617) 655-8833	BP0186 \$1595	1/81 stk	8086 5,8	16/20	64/- 128/-	1M	o	-	24	1
	BP0180 \$1040	★1/83	Z80A 4,2.5	8/20	32/- 8/4	1M	o	-	48	1
	BP0185 \$1040	★1/83	8085A-2 5,2.5,1.25	8/20	16/- 8/8	1M	o	-	24	2
	BP0188 \$2095	4/82	8088	8/20	48/- 128/32	1M	o	-	24	1
Omnibyte Corporation .....	OB68K1A \$1995	6/81 6 wk	68000 10	16/32	96/- 128/128	16M	o	o	40	2
	OB68K/MMU \$2495	★6/83	68010	16/24	32/- 4/-	16M		o		2
One/D Corporation .....	CPB086 \$690	9/82 stk	8086 5,8	16/20	256/- 32/-	1M	o	-	72	1
Pacific Microcomputers .... (619) 436-8649	PM68K8 \$1990	9/81 stk	68000 8or10*	16/24	32/8 256/128	8M	o	o	16	2
	PM68D8 \$2590	9/82 2 wk	68000 8or10	16/24	64/8 256/256	24M	o	o	24	2
Plessey Microsystems .....	PMM 68K \$-	6/82 6 wk	68000 8	16/24	-/- -/-	16M	o	o	16	2
Raster Graphics Inc. .... (503) 620-2241	RG-801 \$595	9/82 stk	Z80A 4	8/16	16/4 8/8	64K	o	-	16	2
	RG-802 \$995	★3/83 -	Z80A 4	8/16	4/4 64/64	64K	o	-	-	2
Relms .....	RSbc-Z80/32 \$1095	- -	Z80A 4	8/24	16/- 32/32	16M	o	-	-	2
SBE, Inc. .... (415) 652-1805	M68K10 \$1995	★2/83 4 wk	68000 10	16/24	64/- 128/128	16M	o	-	24	2
	M68K10x4 \$-	★2/83	68000 10	16/24	64/- 512/512	16M	o	-	24	2
Sibthorp Systems .....	MB-100 \$695	3/81 stk	Z80A 4	8/16	32/- 16/-	64K	-	-	24	1



Counter Timer (No./bits)	Interrupt Levels/ Sources	+5V Only	SBX Conn.	Distinguishing Features
2/16	8/16	-	-	Optional 8087 math processor and PROM resident monitor/debugger; 128K, 32K, or 0Kbytes of RAM.
2/16	9/20	-	-	1 Mbyte system memory addressing; shadowing capability, optional CMOS RAM for battery back-up.
1/16	13/17	-	-	1 Mbyte system memory addressing; shadowing capability, 8-bit on-board general input port.
-	8/8	-	-	Optional PROM resident monitor; supports NEC's ADC <sup>TM</sup> Bus.
3/16	7/-	-	-	128 Kbyte version \$1995. Dual-ported.
1/24	7/-		0	
3/16	9/16	-	1	72 parallel I/O lines, accomodates mixtures of up to 256KB PROM and up to 32KB RAM, multimaster capability, supports RMX-86, SBX connector. Manufacturing rights available.
5/16	7/-	o	-	Two level memory management; no wait states with on-board RAM; expandable to 512 Kbytes; +5 volts only. Languages and operating systems available.
6/16	7/-	o	-	Dual-port no wait state RAM expandable to 8MB; parallel I/O port for SASI, QIC II, or Centronix; Mailbox interrupts; hardward refresh, RS422 & 423. Faster than 68D8 available 10/82.
3/16	7/-	o	-	Includes UNIX port, internal diagnostics, MMU, segment page re-location, IEEE floating point processor optional.
-/-	8/8	-	-	Built-in debugger, trace program execution, disassemble object code, set breakpoint in RAM, Uses 2732 PROM for debug, upload-download Intel hex-format.
-/-	8/8	-	-	Double density floppy disk controller, shadow PROM for CP/M 2.2.
-/-	8/12	o	-	
3/16	8/-	-	2	Dual-ported memory, no wait states; plug-on MXM10 module doubles RAM to 256 Kbyte; multiprotocol serial ports; optional 16 Kbyte CMOS RAM with external backup.
3/16	8/-	-	2	M68K10 loaded w/256K-bit DRAMs; plug-on MXM10x4 module doubles RAM to 1 Mbyte; price and availability depend upon 256K-bit DRAM availability; consult factory.
-/-	8/-	-	-	Optional Am9511 math chip; battery backable static RAM; single master configuration; strappable PROM, RAM, interrupt timing; 2 or 4K memory block disable; programmable baud rate generator; strappable WDT time.

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## Single Board Computers

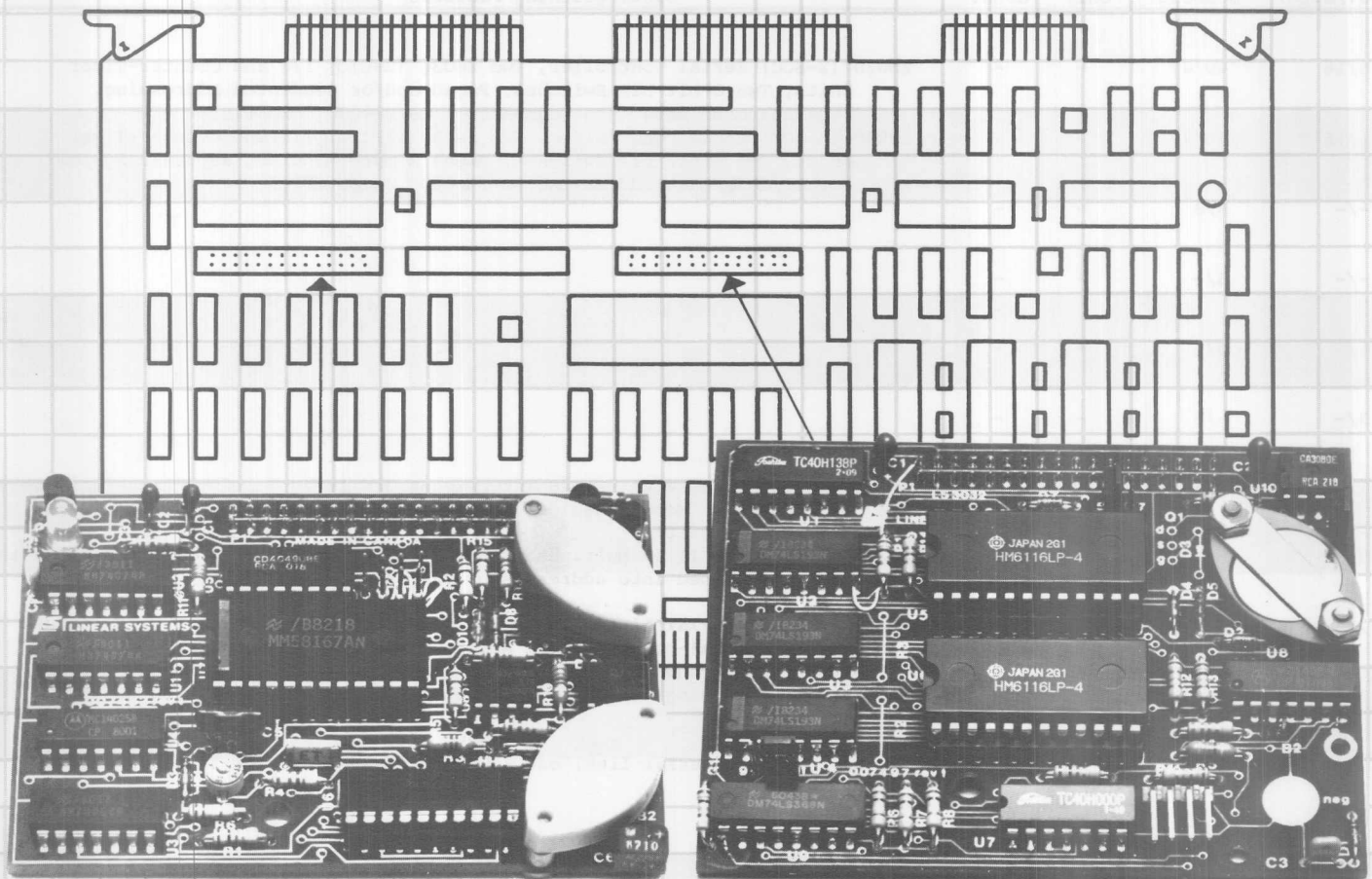
Manufacturer	Model/ Price	DFA/ Deliv.	CPU/Clock Speed (MHz)	Data Bus/ Address (bits)	Cap./Supplied (Kbytes) ROM	Total Add. (bytes) RAM	Multi- master	Parallel DMA	I/O Lines	(RS232) Ports
Single Board Solutions .... (408) 253-0181	MB8001 \$995	★4/83 -	Z8001 4	16/24	128/- 176/128*	8M	o	-	40	2
	MB8002 \$995	★4/83 -	Z8002 4	16/20	128/- 176/128*	1M	o	-	40	2
Systemathica .....	MBC 8001 \$350	-	8080A 4	16/20	64/-	64K	-	-	48	4 8*
	MBC 16001 \$750	1	8086 5 or 8	16/20	64/-	64/16	1M	-	24	1 8*
Thomas Engineering Co. .... (415) 680-8640	MZ-80 \$1200	6/82 -	280B 2.5, 5, 6	-/-	4/-	32/-	-	-	12	2
	MZ-68K \$2000	★4/83 -	68000	-/-	128/-	128/-	-	-	o	2
TITN, Inc. .... (415) 348-9181 (612) 831-4422	TN/6831 \$1595	80 6 wk	6809 .9, 1.3, 1.8	-/20	32/-	16/16	1M	o	o	1
	TN/6844 \$1595	81 6 wk	6809 1.1, 1.4, 1.8	-/20	32/-	16/16	1M	o	-	14.2 4
	TN/6835 \$1795	7/82 8 wk	6809 1.1, 1.4, 1.8	-/24	32/-	64/64	16M	o	o	48 2
	TN/68K30 \$2995	7/82 10 wk	68000 8	16/24	64/0	128/128	16M	o	-	2
	TN/86/40 \$2995	7/82 10 wk	8086 5/8	16/24	32/-	128/128	16M	o	-	24 3
TSD Display .....	M60139/ 60141 \$2495	- stk	68000 8	16/20	32/4	256/128	1M	-	-	-
Zendex Corporation .....	ZX-86 \$1545	- stk	8086 5, 8, 10	16/20	64/-	8/8	1M	o	o	24 1 2*
	ZX-80/15 \$550	- stk	8085A-2 2 or 5	8/16	32/-	2/1	64K	o	o	22 1
	ZX-85 \$2660	- stk	8085A-2 5	8/16	2/2	64/64	64K	o	o	- 2
	ZX-88 \$2750	- stk	8088 5	8/20	2/2	64/64	1M	o	o	- 2
	ZX-82 \$1995	- stk	28002 4	16/16	8/8	32/32	64K	o	o	24 2
	ZX-86/87 \$1832	- stk	8086/87 5	16/20	64/-	8/8	1M	o	o	42 1 2*

# NEW SBX

## FUNCTIONS

Counter Timer (No./bits)	Interrupt Levels/ Sources	+5V Only	SBX Conn.	Distinguishing Features
6/16	40/47	-	-	Z8030 (Z-SCC) Serial Controller, Two Z8036 (Z-CIO) I/O and Counter-Timer Units, Two 8-bit DIP Switches, Paged and/or Segmented Addressing, Separate Code/Data (non-segmented), CP/M-8000 compatible.
6/16	40/47	-	-	Z8030 (Z-SCC) Serial Controller, Two Z8036 (Z-CIO) I/O and Counter-Timer Units, Two 8-bit DIP Switches, Paged Memory Mapping, Separate System/Normal/Code/data addressing, CP/M-8000 compatible.
-/-	8/8	-	-	
-/-	8/-	-	-	
1/-	8/-	-	-	
3/-	-/-	-	-	
1/-	8/-	-	-	2 HDLC serial lines with DMA; 8 interprocessors IT by Multibus transfer; dual-port memory. Memory divided in 4 Kbytes mapped into addresses by the on-board circuitry.
2/-	8/-	-	-	8 interprocessors IT by Multibus transfer; dual-port memory; memory divided in 4 Kbytes mapped into addresses by the on-board circuitry.
2/-	8/-	-	-	Multiprotocols serial lines (async-bits); 8 interprocessors IT by Multibus transfer, dual-port memory. Memory divided in 4 Kbytes mapped into addresses by the on-board circuitry.
3/16	14/28	-	1	Dual-port RAM mapping of memory with resolution of 64 bytes in off-board request.
3/16	9/26	-	1	One asynchronous serial line; one asynchronous HDLC serial line.
3/-	7/-	-	-	
3/16	8/8	-	3	Socket for optional 8087 numeric processor. Software transparent to Intel iSBC-86/05. Optional dual SIO provides 2 serial ports.
1/14	4/15	-	3	Software compatible with Intel iSBC-80/05 and iSBC-80/10B.
3/16	16/15	-	-	Maybe converted to ZX-88. Intel MDS IPB-80 and IPC-85 compatible.
3/16	16/15	-	-	May be converted to ZX-85.
5/5	8/24	-	-	32K dual-port RAM.
3/16	8/8	-	3	Same as ZX-86 but includes 8087 co-processor.

# 2 NEW SBX FUNCTIONS



## LS 7482

### CALENDAR CLOCK

- On Board power fail protection
- Two programmable Interrupts
- One Year Calendar-time to 1/1000 sec.
- Based on the National MM58167A

It's a reliable timekeeper with many extras. For instance on board power fail detection protects time data without CPU overhead. Programmable alarm functions are available as interrupt outputs, or from a status read.

## LS 3032

### BATTERY BACKUP MEMORY

- 5 Year Data Retention with Li cell
- Protects Critical Data on Power down
- Speed Limited only by Port Access Time
- 4 K byte capacity

This non-volatile memory allows critical data to be retained in spite of power failures. A read or write to the port automatically increments the address pointer for the highest possible data transfer rate.

## FOR MORE INFORMATION WRITE OR CALL

USA: INDUSTRIAL MODULES INC. 24G - 1400 COLEMAN AVE. SANTA CLARA CA 95050 (408) 988-1911  
CANADA: LINEAR SYSTEMS 1122 SANFORD ST. WINNIPEG, MB R3E 2Z9 (204) 774-7991



## SBX Expansion Modules

Advanced Micro Devices  
Centigram Corp.  
Douglas Electronics, Inc.  
General Digital Corp.  
Intel Corporation  
Linear Systems Ltd.  
Logitech, Inc.  
Matrox Electronic Systems  
Medinova Corporation  
Micomp Development Corp.  
National Semiconductor Corp.  
Procise Corporation  
R & D Electronics (Pty) Ltd.  
SBE, Inc.  
TITN, Inc.  
Zendex Corporation

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. A vertical margin line is present on the left side, creating a narrow left margin. The paper appears to be from a notebook or a standard ruled document. There are some faint smudges and marks on the surface, particularly near the top right corner.

## SBX Expansion Modules

Manufacturer	Model	Price	DFA/ Deliv.	Type	Compatibility/ Features
Intel Corporation ..... See Sales Office Listing	iSBX311	\$610	-	Analog Input	16 channels (8 diff.), 12-bit resolution, 50 usec conversion time. iCS 910 termination panel.
	iSBX328	\$750	-	Analog <del>Input</del> <b>OUTPUT</b>	8 channels, 12-bit resolution, utilizes Intel UPI-41 as intelligent prog. mux.
	iSBX488	\$650	-	IEEE 488 (GPIB)	15 talker, listener or talker/listener devices.
	iSBX2178	\$495	-	1/4" Magnetic Tape Interface	Compatible with certain streaming or start/stop drives.
	iSBX218	\$540	-	Flexible Disk Controller	Single or double sided and density, on-board data separator.
	iSBX270	\$750	-	Video Display Controller (DW)	B&W or color, Alphamosaic CRT/Keyboard.
	iSBX275	\$995	-	Video Graphics Controller	B&W or color graphics, uses i82720 (GDC)
	iSBX331	\$350	-	Fixed/Floating Point Math	Intel 8231 APU at 4MHz; floating point 32-bit.
	iSBX332	\$350	-	Floating Point Math	
	iSBX350	\$155	-	Programmable Parallel I/O	24 programmable I/O lines, +5V only.
	iSBX251	\$895	-	Bubble Memory Expansion	Auto error detection correction; 48 ms access times 100 Kbps burst data rate.
	iSBX251C	\$695	-	Bubble Memory Expansion	Same as iSBX-251 except operates from 10°C to 40°C.
	iSBX351	\$230	-	Programmable Serial I/O	Two programmable 16-bit BCD/binary timers.
	iSBX352	\$395	-	Programmable Communications	HDLC/SDLC, half/full duplex; point-to-point multidrop; NRZI SDLC loop; RS-232C and RS442A/449 interface.
	LS7482	\$376	5/82	Calendar Clock	Single-wide, 1 year calendar, Programmable alarms.
Linear Systems Ltd. .... (204) 774-7991	LS3032	\$330	★ 1/83	Battery Backup Memory	4 Kbytes, 5 year lithium cell.

continued next page

## SBX Expansion Modules

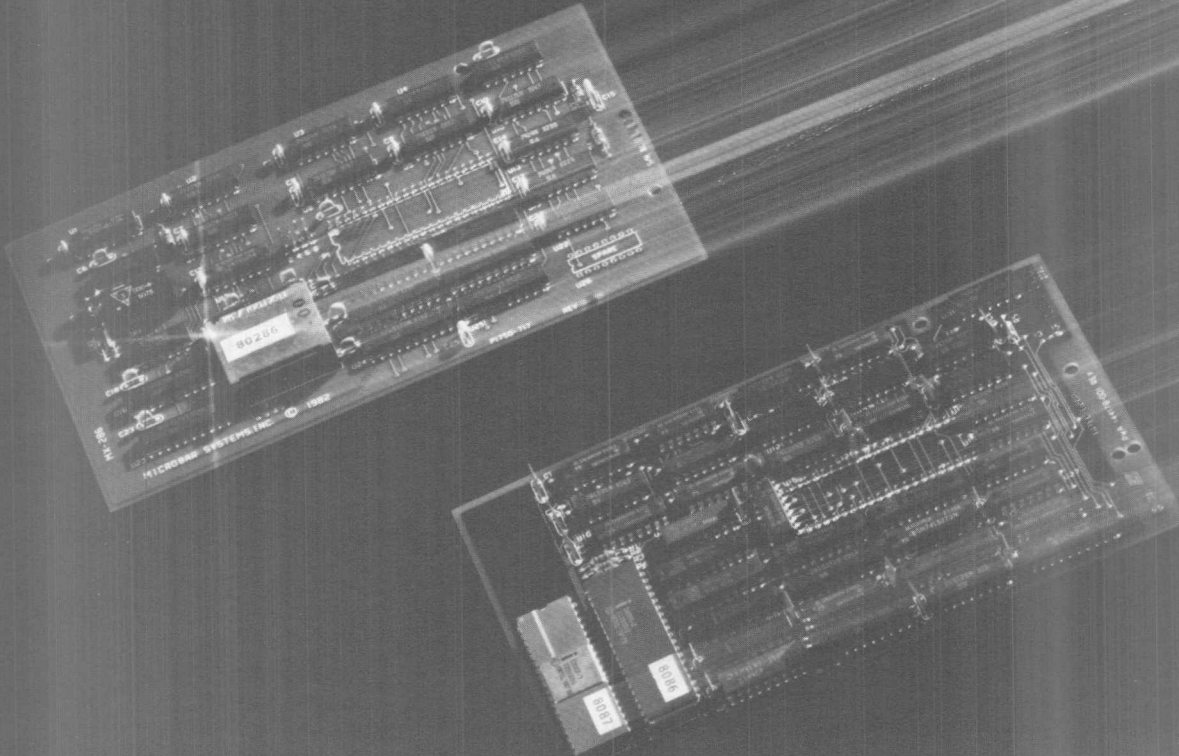
Manufacturer	Model	Price	DFA/ Deliv.	Type	Compatibility/ Features
Logitech, Inc. .... (415) 326-3885	LX-350	\$140	★ 12/82 2wk	Programmable Parallel I/O	SBX-350 compatible. Sockets for inter- changeable line drivers, receivers and termination. Allows use of all 8255 modes.
	LX-360	\$200	★ 12/82 2wk	Hard Disk Interface Module	Provides SASI bus interface, generates interrupts and signals for DMA con- trollers. To 8 intelligent peripherals.
	LX-377	\$470	9/82 2wk	Floating Point Processor	Adds an 8087 to the 8086 of the PY8610 SBC.
Matrox Electronic Sys. (514) 735-1182	MSBX-423	\$380	-	Dual Serial Interface	RS-423/RS-232C compatible, sync./ async operation. Interrupt on parity overrun or framing error.
	MSBX-800	\$-	-	High Resolution Color Graphics	Uses programmable resolution from 256x256x4 to 1024x768x4.
Medinova Corporation . (312) 870-0855	MSBX-241	\$355	★ 1/83 stk	Real-Time Clock Calendar	Time-of-day/calendar w/o wait states, 12/24 hour, BCD/binary data, alarm and periodic interrupt sources.
Micomp Development ...	MX-201	\$295	4/83	Clock Calendar	Battery protected, +5V only, battery protected RAM & comparator.
National Semiconductor See Sales Office Listing	BLX-321	\$400	stk	Analog Output	10-bit resolution.
	BLX-350	\$155	stk	Programmable Parallel I/O	24 I/O lines.
	BLX-351	\$230	stk	Programmable Serial I/O	RS-232C or RS449/422 operation.
	BLX-391	\$100	stk	Prototyping Module	Up to 14 16-pin devices.
	BLX-281	\$180	stk	Speech Synthesis Module	144 Word vocabulary.
	BLX-331	\$450	stk	Fixed/Floating Point Math	4MHz single/double precision 32-bit floating point and transcendental functions.
	BLX-355	\$-		Dual Channel Protocol Controller	SDLC/HDLC/ADCCP or bi-sync operation.



## SBX Expansion Modules

Manufacturer	Model	Price	DFA/ Deliv.	Type	Compatibility/ Features
Proclise Corporation (206)392-0270	ARX-429	\$795	8/81 10wk	ARINC-429 Transceiver	Double wide; 8-16-bit; 2 receive channels and 1 transmit channel
R&D Electronics(PTY)Ltd. (011)834-1204/5 (South Africa)	QBX-PCC	\$400	1/82	Parallel I/O-Clock-Julian Calendar	On-board stand-by NiCad battery and up to 13 buffered I/O lines.
	QBX-FOG/C	\$452	3/82	Non-volatile CMOS Memory	256 bytes organized as a stack. Stack pointer fully programmable. Standby voltage required.
	QBX-FOG/E	\$568	5/82	Non-volatile RAM Memory	64 or 256 bytes with shadow E <sup>2</sup> PROM organized as a stack. +5V only (no standby).
	QBX-MSP	\$652	8/82	Serial I/O	Double wide SBX, 2 or 4 serial async. parts; prog. baud rate; RS-232C.
	QBX-TMR	\$-	★4/83	Timer-Counter	5x16-bit timer/counters; used AMD9513, inputs overvoltage protected. Outputs buffered.
SBE, Inc. .... (415)652-1805	SBEX-SASI	\$295	★2/83	SASI Bus Interface	Single width; supports DMA; interface to disk and tape controllers.
TITN, Inc. .... (415)348-9181	ISBX TN-05	\$530	-	Programmable Communications Controller	Two async/sync/HDLC/SDLC/full duplex lines, RS-232C.
Zendex Corporation ... (415)828-3000	ZBX-218B	\$480	8/81 stk	Flexible Disk Controller	Single/double density-side 8" or 5¼", single or dual sided drives.
	ZBX-324	\$291	7/81 stk	Analog I/O	Two 8-bit ADC and two 8-bit DAC ISBC-80/10B, 80/24 +5V only.
	ZBX-351	\$209	- stk	Serial I/O	RS-232C, 449/421, one channel, uses 8251 with 8253 timer.
	ZBX-350	\$141	7/81 stk	Parallel I/O	24 lines, uses 8255A P10.
	ZBX-349	\$141	6/81 stk	Centronics Line Printer Interface	Includes printer interface cable.
	ZBX-348	\$320	★1/83 stk	Time of Day Clock	Battery back-up, flexible periodic interrupts.
	ZBX-488	\$500	- stk	IEEE-488 Interface	Uses T.I. TMS-9914 GPIB controller.
	ZBX-391	\$85	1/82 stk	Prototyping Module	

# NEVER HAS SO MUCH BEEN AVAILABLE SO SOON



## iAPX 286\* Overpowering Performance For 8086 Systems

Doubled execution speed and virtual memory without the normal time delay of a new CPU design.

The **Microbar MX286** gives you full iAPX 286 capability with 8 Mhz operation, up to 16 Megabytes physical address space, one Gigabyte virtual space, plus built-in memory management. And it all plugs into most existing 8086 sockets.

Doubled processing speed is immediate.

Using the virtual memory requires software changes. Microbar makes the changes easier with their iAPX 286 software Development Vehicle.

MX286 custom form factors are available with low cost, quick manufacturing turn-around.

\*iAPX 286 is a trademark of Intel Corp.

## XENIX\* Style Hardware Memory Management

Multiuser hardware memory management designed to run Microsoft's Xenix on 8086 systems.

The **MM86** gives you multiuser system performance with one megabyte addressing, memory protection, non-contiguous block mapping, up to 32 processes, plus an optional 8087 co-processor. And it plugs into most 8086 sockets.

The MM86 works with any bus structure.

Custom form factors are available with low cost, quick manufacturing turn-around. And of course OEM discounts are available.

The MM86 and MX286, from Microbar, are part of a family of CPU enhancing modules for leading 16 bit microprocessors.

\*XENIX is a trademark of Microsoft Corp.



**For more information  
call or write today  
(415) 964-2862**

## Expansion Cards (not SBX)

Advanced Micro Devices  
Intel Corporation  
Metacomp, Inc.  
Microbar Systems  
National Semiconductor Corp.  
Proclise Corporation  
SBE, Inc.  
Zendex, Corporation

## Expansion Cards (not SBX)

Manufacturer	Model	Price	DFA/ Deliv.	Type	Compatibility/ Features
AMD ..... (408)988-7777	97/343	\$-		Memory Expansion Board (for 97/8605)	8K RAM, sockets for up to 64Kbytes of EPROM.
Intel Corporation .... See Sales Office Listing	iSBC337	\$337	-	Numeric Data Processor	iSBC 86, 88, and iAPX 86, 88 systems. Utilizes Intel 8087.
	iSBC302	\$450	-	8 Kbytes Static RAM	iSBC 86/05, 88/25. Expands memory to 16 Kbytes.
	iSBC303	\$-	-	Parity for on-board RAM	iSBC 86/12A, 86/14.
	iSBC308	\$650	-	Memory Management and Protection	Plug-on memory management and protection for iSBC 86/12A.
	iSBC309	\$750	-	Memory Management and Protection	For iSBC-86/14 and iSBC-86/30.
	iSBC341	\$150	-	EPROM board	iSBC 86/05, 88/40, 88/25. Sockets for up to 64 Kbytes.
	iSBC340	\$140	-	16 Kbyte PROM	iSBC 86/12A.
	iSBC300	\$500	-	32 Kbyte RAM	iSBC 86/12A.
	iSBC301	\$325	-	4 Kbyte Static RAM	iSBC 80/24, 88/40.
	iSBC300A	\$600	-	32 Kbyte Dynamic RAM	iSBC 86/14.
	iSBC304	\$900	-	128 Kbyte Dynamic RAM	iSBC 86/30.
	iSBC305	\$615	-	RAM ECC Protection	iSBC 028A (RAM board)
	iSBC306	\$795	-	RAM ECC Protection	iSBC 056A (RAM board)



## Expansion Cards (not SBX)

Manufacturer	Model	Price	DFA/ Deliv.	Type	Compatibility/ Features
Metacomp, Inc. .... (619) 571-1168	NDX2000	\$395	★3/83 30da	Numeric Data Processor	Expansion module for iAPX-186 socket to allow addition of 8087 numeric data co-processor.
	DBX2000	\$795	★3/83	iAPX-186 Debug Tool	Debug tool to allow use of ICE-86 in-circuit emulator in iAPX-186 based design. Operates with METACOMP MPA-2000.
Microbar Systems .... (415) 964-2862	MM86-5	\$495	-	5MHz Memory Management	5 MHz; C86, GPC86, DBC86 (Replaces Intel iSBC 308, 309)
	MM86-8	\$445	1/82 1wk	8MHz Memory Management	Same as MM86-5 except 8 MHz.
	MM68K-SUN	\$695	★4/83 30da	Page-Style Memory Management	For Microbar DBC68K2 SBC.
	MX286	\$995	★4/83 30da	80286 in 8086 Socket	Any 8086 CPU board; C86, GPC86, DBC86.
National Semiconductor See Sales Office Listing	BLC-300	\$500	stk	32 Kbyte RAM	Second source iSBC-300, use on 86/12B
	BLC-8302	\$450	stk	8K Static RAM	BLC 86/05
	BLC-337	\$337	stk	8087 Numeric Data Processor	Use on BLC-86/05, BLC-86/12B.
Procite Corporation .. (206) 392-0270	REPEATER	\$795	★2/83 4wk	Bus Repeater	Repeats Multibus signals into additional card cages for expansion. 16-bit data 24-bit address.
SBE, Inc. .... (415) 652-1805	MXM10	\$495	★3/83 4wk	128 Kbyte Memory Expansion	Fits M68K10 to double fuston-board RAM; Optional 512 Kbyte version.
Zendex Corporation ... (415) 828-3000	ZX-343	\$425	★4/83	Combo RAM and ROM	Fits on ZX-86, provides 8 Kbyte RAM and 32 Kbyte of expansion ROM.

# The OEM's Choice for Multibus\* Quality and Reliability

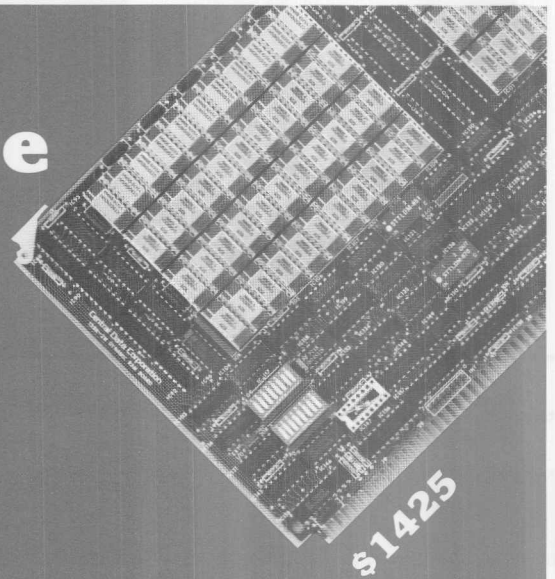
**NEW  
512K  
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**Your  
Complete  
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**Central Data  
Corporation**

1602 Newton Drive,  
Champaign, IL 61821-1098,  
(217) 359-8010 TWX 910-245-0787

\*Multibus is a trademark of Intel Corporation.  
Prices shown are quantity 100, 512K RAM.



## **128K-512K Dynamic RAM with EDC**

Error detection/correction (EDC), high speed and increased noise immunity are standard features that give you a number of user options with this versatile new board. Completely Multibus compatible, this board allows you to add 128K, 256K, 384K or 512K of RAM to any 8- or 16-bit system without making changes. It decodes the full 24-bit address bus for a system-wide memory of 16 megabytes and runs at a fast read access time of 275ns. EDC corrects all single-bit errors without processor intervention. It also flags double-bit errors, generating an interrupt so input ports can be read to determine which RAM chip failed. Or, you can strap the board to interrupt on any error. And noise won't bother this board, either — its five-layer construction incorporates power and ground into the two internal layers. High reliability sockets with integral by-pass capacitors further minimize noise.

## **128K-512K Parity Only Dynamic RAM Board**

This new board delivers all the quality features of the 128K-512K EDC Dynamic RAM Board except that parity detection is used rather than error correction. The parity circuitry will detect any single-bit errors, optionally generating an interrupt so the CPU can determine which row of RAMs had the error. Four easy to read LED's on the top of the board show the check condition, allowing fast replacement in the event of a failure. Writing to the corresponding output port clears the parity error. Completely Multibus compatible, the board runs at a rapid 245ns access time. And here's some refreshing news about wait states — the on-board arbitration circuitry cuts down on wait states caused by refresh cycles. You also get hidden refresh — if the processor accesses another board in the system at any time between refresh cycles, a new refresh cycle is initiated to overlap the memory cycle on the other board.

**OEM quantities and pricing are available on these and on Central Data's complete line of Multibus boards. For more information call or write.**

## Dynamic RAM

Advanced Digital Technology  
Advanced Micro Devices  
Advant MicroSupport  
AIM Technology  
Central Data Corporation  
Chrislin Industries  
Comark Corporation  
CYB Systems, Inc.  
Datacube, Inc.  
Densan Co., Ltd.  
Distributed Computer Systems  
Edge Micro Systems  
Heurikon Corporation  
Intel Corporation  
Intersil Systems  
Logitech, Inc.  
Matrox Electronic Systems  
Microbar Systems, Inc.  
Micro Industries  
Micro Memory, Inc.  
Monolithic Systems Corp.  
Motorola  
National Semiconductor Corp.  
NEC Electronics U.S.A.  
One/D Corporation  
Plessey Microsystems  
Questar Computer Systems  
Relms  
Texas Instruments  
Zendex Corporation

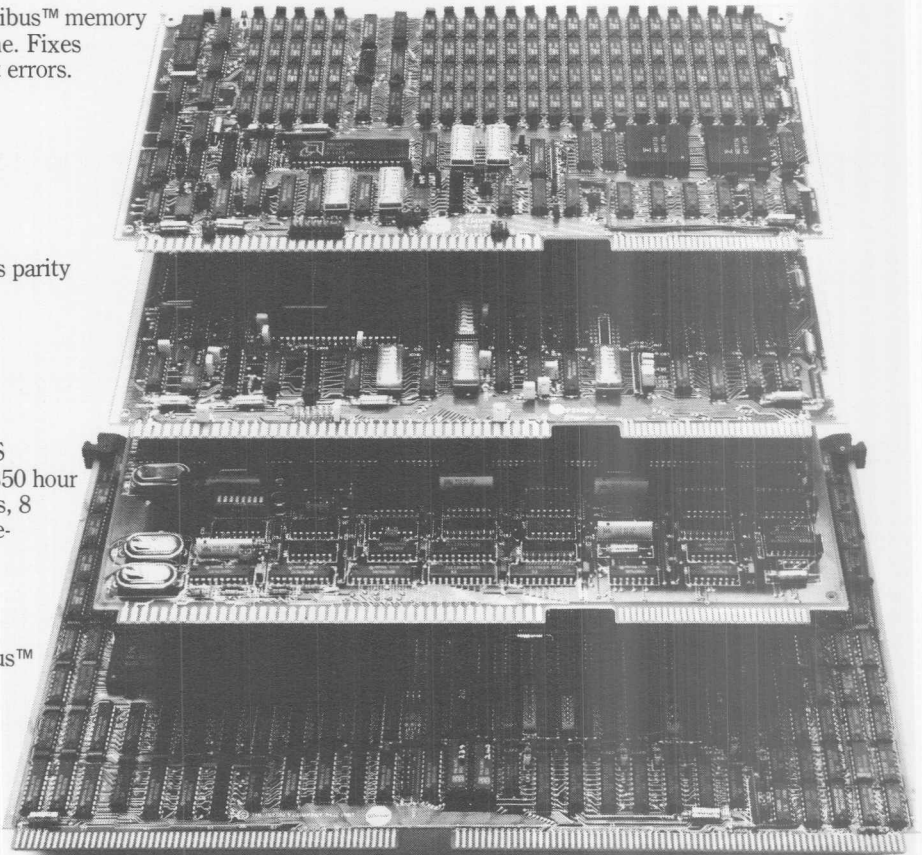
# THE BUS STOCKS HERE:

PSM-512A: 512 kbyte Multibus™ memory with ECC, 275 nsec access time. Fixes single-bit errors, flags multi-bit errors.

PSM-512P: 512 kbyte Multibus parity memory, 240 nsec access time. Very economical.

PSM6463: 64 kbyte non-volatile CMOS Multibus memory, 200 nsec access time. 350 hour standby with on-board rechargeable NiCd's, 8 years with lithium. For process control, telecommunications, other critical applications.

NEW PSM1VA: 1 megabyte VERSAbus™ memory with ECC, 300 nsec access time. Lots faster and much less expensive than Motorola and IBM equivalents. Full 32-bit VERSAbus compatibility.



If you're on board the Multibus or VERSAbus, we've got the memories you need to get where you're going faster, for less. ECC, parity and non-volatile CMOS. All in stock now, all with one thing in common. Their first name is Plessey.

And since Plessey makes them all, they all have high reliability, a one year warranty and Plessey support worldwide.

For more information, just contact Plessey

Microsystems, 451 Hungerford Drive, Rockville, MD 20850. (301) 279-2892, TWX 710-828-9815. Irvine, CA: (714) 540-9931.

In Europe, contact: Towcester, UK: (0327)50312, Telex 31628. Paris: 776 41 06. Noordwijk: (01719) 19207. Munich: (089)2362226. Rome: (06) 350189.

Or get on board fast by calling (800) 368-2738 today. Your bus ought to be going our way.

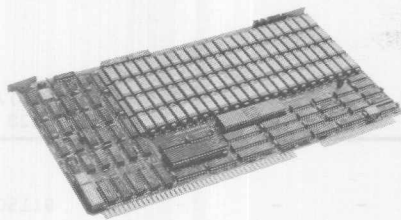


Multibus is a trademark of Intel  
VERSAbus is a trademark of Motorola



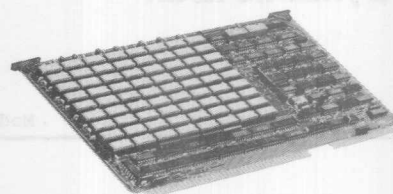
# MULTIBUS\* MEMORIES

## DYNAMIC RAM (IEEE P796-COMPATIBLE)



### MM-8086E

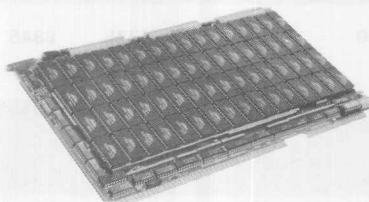
- 512K, 256K bytes
- Error detection and correction
- 1000<sub>H</sub> boundaries/16 Mbyte address
- Access/Cycle: 300/500 nsec
- CSR/ESR for EDC control and LED error correction indication
- Battery backup option



### MM-8086D

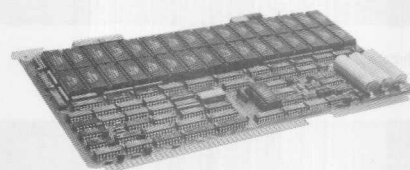
- 512K, 256K, 128K, 64K bytes
- For 8 and 16-bit processors
- 1000<sub>H</sub> boundaries/16 Mbyte address
- Even parity with output selectable to any of bus interrupts
- ACCESS/Cycle: 250/400 nsec

## NON-VOLATILE CMOS RAM (IEEE P796-COMPATIBLE)



### MM-8000C

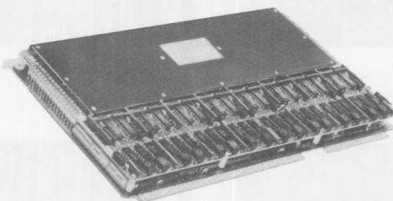
- 128K, 64K bytes
- Data retention (on-board batt.):  
2 weeks rechargeable batteries
- 4000<sub>H</sub> boundaries/16 Mbyte address
- Access/Cycle: 220/220 nsec
- Battery status line allows monitored battery condition
- Redundant batteries provide improved reliability
- Accommodates 2716 EROM



### MM-8086C

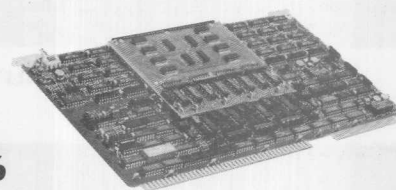
- 64K, 32K, 16K bytes
- Data retention (on-board batt.):  
3 weeks rechargeable batteries  
2 yrs. non-rechargeable batteries
- 1000<sub>H</sub> boundaries/16 Mbyte address
- On-board calendar/clock
- Access/Cycle: 250/250 nsec
- Redundant batteries provide improved reliability
- Accommodates 2716 EROM

## NON-VOLATILE CORE MEMORY



### MM-8086

- 32K bytes
- For 8 and 16-bit processors
- 1000<sub>H</sub> boundaries/1 Mbyte address
- Access/Cycle: 375/1200 nsec
- Power monitoring for data protection



### MM-8086/16

- 16K bytes
- For 8 and 16-bit processors
- 4000<sub>H</sub> boundaries/1 Mbyte address
- Access/Cycle: 280/800 nsec
- Power monitoring for data protection

ONE YEAR WARRANTY ON PARTS AND LABOR

ALL BOARDS TEMPERATURE-CYCLED AND BURNED-IN DURING MEMORY DIAGNOSTICS

**micro  
memory  
inc**

9436 Irondale Ave.  
Chatsworth, CA 91311  
Phone: (213) 998-0070

\*Trademark of Intel Corp.

## Dynamic RAM

Manufacturer	Model	DFA/ Deliv.	Memory Capacity (Kbytes)/Price									
			16	32	48	64	96	128	256	384	512	
Advanced Digital Technology.	VLS-XXX	-	-	-	-	-	-	-	\$1150	\$1350	\$1550	\$1750
AMD .....	Am96/1000	6/82 stk	-	-	-	\$1445	-	\$1870	-	-	-	-
(408)988-7777	Am97/0000	7/82 stk	-	\$670	-	\$683	-	\$740	\$1250	-	\$1599	-
Advant Corp. ....	MS7200	★10/82 -	-	-	-	-	-	-	-	-	-	*
AIM Technology .....	512KB ECC	7/82 30da	-	-	-	-	-	-	-	-	-	\$2990
(408)727-3711												
Central Data Corporation ...	B1020	6/80 stk	-	\$640	-	\$705	\$775	\$845	-	-	-	-
(217)359-8010	B1040	★5/83 stk	-	-	-	-	-	\$1050	\$1300	\$1550	\$1800	-
	B1027	★2/83 stk	-	-	-	-	-	\$1310	\$1615	\$1920	\$2225	-
Chrislin Industries .....	CI-8086	-	-	\$250	-	\$575	-	\$995	\$2650	-	\$3995	-
Comark Corporation .....	MR85-32	11/81 -	-	\$395	-	\$495	\$595	\$695	-	-	-	-
(617)894-7000	MR86-128	2/82 -	-	-	-	-	-	\$695	\$895	\$1195	\$1395	-
Cyb Systems, Inc. ....	256K	9/82 -	-	-	-	-	-	-	\$1450	-	-	-
(512)458-3224												
Datacube .....	RM119-016	-	\$630	\$599	o	\$649	-	-	-	-	-	-
(617)535-6644												
	RM117	-	\$1200	-	-	-	-	-	-	-	-	-
Densan .....	DSB-064A	-	-	-	-	*	-	-	-	-	-	-
Distributed Computer .....	ECC128	-	-	-	-	-	-	\$1280	*	-	\$3000	*
(716)899-6619												
(800)225-4589												
Edge Micro Systems .....	B128K	-/82 -	-	-	-	-	-	\$500	-	-	-	-

Access Time (ns)	Cycle Time (ns)	Parity or ECC	Data Bus/ Address (bits)	Distinguishing Features
250	440	E	8-16/24	Up to 1536K bytes available, dynamic memory mapping.
200	350	P	8-16/20	Dual bus memory board which permits normal arbitrated P1 access, and high speed, unarbitrated P2 access.
200	350	P	8-16/24	Very fast memory board with low power consumption.
-	-	E	8-16/24	IEEE 796, Intr. on single/double bit errors; error status LED's.
250	-	E	8-11/24	One wait state access time with AIM 68000 CPU. On-board refresh circuitry, with 6 hamming coded ECC bits. Fully diagnosable. Manufacturing license available.
330	450	P	8-16/24	Addressable 64K memory boundry, 16K deselect.
245	345	P	8-16/24	
275	375	E	8-16/24	
270	400	P	8-16/-	Up to 512 Kbyte in a single option slot.
350	-	P	8-16/24	4K Bank disable.
350	-	P	8-16/24	16K Bank disable.
-	-	-	-	
350	550	-	-16/20	All versions fully socketed.
350	-	-	-16/20	Dual-ported for dual processor systems; virtual 1 Mbyte memory space; optional expansion 16K, \$650.
450	-	*	-16/-	
-	-	E	-/-	Error detection and correction; 55°C "burn-in".
270	-	P*	16/20	

continued next page

## Dynamic RAM

Manufacturer	Model	DFA/ Deliv.	16	32	Memory Capacity (Kbytes)/Price							
					48	64	96	128	256	384	512	
Heurikon Corporation ..... (608) 271-8700 (800) 356-9602	MLZ-EDC	-	-	-	-	-	-	\$1695	\$1995	-	\$2995	
	MLZ-128-P	-	-	-	-	-	-	\$1195	\$1495	-	\$1895	
Intel Corporation ..... See Sales Office Listing	064	-	-	\$695	-	\$590	-	-	-	-	-	
	iSBC 028A/056A	-	-	-	-	-	-	\$742	\$1260	0	0	
	iSBC 064A/012B/ 032A	-	-	\$500	-	\$685	-	-	-	-	\$1604	
	iSBC 028C/056C/ 012C	-	-	-	-	-	-	\$1520	\$1950	-	\$2860	
Intersil Systems ..... (408) 743-4599	iSBC 028CX/ 056CX/012CX	-	-	-	-	-	-	\$1900	\$2450	-	\$3575	
	MCB-512	9/81 stk	-	-	-	-	-	\$1429	\$1786	-	\$2571	
Logitech, Inc. .... (415) 326-3885	PYO256	4/82 2 wk	-	-	-	-	-	\$690	\$975	-	-	
Matrox Electronic ..... (514) 735-1182	MEGA 1	-	-	\$650	-	\$965	-	\$1470	-	-	-	
	MEGA 4	-	\$680	-	-	\$995	-	\$1365	\$1730	-	\$2100	
Microbar Systems ..... (415) 964-2862	DBR50-128	3/82 1wk	-	-	-	-	-	\$1455	\$1715	-	\$2275	
Micro Industries ..... (614) 895-0404	MIB016A	-	\$490	\$600	-	\$785	-	-	-	-	-	
MicroMemory, Inc. .... (213) 998-0070	MM8086D	8/81 -	-	\$400	-	\$425	-	\$625	\$695	-	\$895	
	MM8086E	9/82 -	-	-	-	-	-	\$950	\$1195	-	\$1495	
Monolithic Systems Corp. ... (303) 770-7400	MSC 4805	-	-	-	-	-	-	\$1604	\$1903	\$2200	\$2500	



# Dynamic RAM

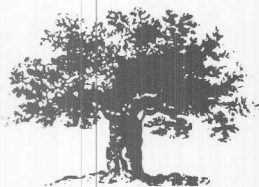
Access Time (ns)	Cycle Time (ns)	Parity or ECC	Data Bus/Address (bits)	Distinguishing Features
-	-	E	-/-	
-	-	-	-/-	
450	-	-	8-16/20-24	
500	-	P	8-16/24	Optional: iSBC 305/306 ECC Multimodule.
330-500	-	P	8-16/24	
350	460	E	8-16/24	High performance RAM with ECC.
380	490	E	8-16/24	Multibus/iLBX bus compatible, dual port high performance RAM with ECC.
460	660	E	8-16/-	Single +5V operation; compatible with iSBC 80/10, 80/20, 80/30, 80/12;
350	400	P*	8-16/24	Optional dynamic mapping; up to 8 memory blocks (32 Kbytes) on line at the same time for 16/20/24-bit address systems.
400	-	-	8-16/-	
625	725	P	8-16/24	Memory management.
215	440	P	8-16/24	Dual bus (IEEE 796 & high speed), high speed port may be accessed by DBC 86 or DBC 68K while a 796 cycle is in progress.
360	600	- P*	8-16/-	Dynamic RAM.
250	400	P	8-16/24	Selectable in 4K increments. Parity output selectable to any of the Bus intercepts.
300	500	E	8-16/24	Error detection and correction circuitry provides for double-bit error detection and single-bit error correction. CSR/ESR registers in the I/O page for error logging and manipulation.
450	500	ECC	8-16/20	Error detection and correction (EDAC) circuitry provides for double-bit error detection and single-bit error correction.

continued next page

## Dynamic RAM

Manufacturer	Model	DFA/ Deliv.	Memory Capacity (Kbytes)/Price									
			16	32	48	64	96	128	256	384	512	
Motorola .....	MMS8701	-	-	-	-	-	-	-	\$1125	\$1465	-	-
	MMS8512E	-	-	-	-	-	-	-	\$1450	\$1790	-	\$2543
National Semiconductor .....	BLC-OXXX	-	-	-	\$575	\$612	-	-	\$928	\$1136	-	\$1490
See Sales Office Listing	BLC-80XXX	-	\$520	-	\$609	\$800	-	-	-	-	-	-
NEC Electronics U.S.A. ....	BPO300	9/81	-	-	-	-	-	-	\$1255	\$1695	-	-
(617)655-8833												
One/D Corporation .....	SRM XX	4/82 stk	-	\$440	-	\$510	-	-	\$650	\$930	-	\$1490
Plessey Microsystems .....	PSM 512A	7/81 stk	-	-	-	-	-	-	\$769	\$1016	-	\$1595
(301)279-2892												
(800)368-2738	PSM 512P	6/82 stk	-	-	-	-	-	-	\$565	\$775	-	\$1200
Questar Computer Sys. ....	SBM-100	2/82 -	-	-	-	0	0	-	0	0	0	\$1092
(408)286-2866												
	SBM-110	★2/83 -	-	-	-	0	0	-	0	0	0	\$1130
	SBM-150	★2/83 -	-	-	-	-	-	-	0	0	0	\$1695
Relms .....	rMEM64K-BE	-	-	\$518	-	\$640	-	-	-	-	-	-
	rMEM256K-BE	-	-	-	-	\$1095	-	-	\$1813	\$1950	-	-
	rMEM64K-D	-	\$466	\$518	\$576	\$640	-	-	-	-	-	-
Texas Instruments .....	TMM40010A	-	-	-	-	-	-	-	\$1315	\$1690	-	\$2495
	TMM40020	8/82	-	-	-	-	-	-	\$1059	\$1300	-	\$1795
Zendex Corporation .....	ZX-012	1/82 stk	-	-	-	-	-	-	-	*	-	\$3595
(415)828-3000												
	ZX-028B	5/80 stk	-	-	-	-	-	-	\$1050	-	-	-

Access Time (ns)	Cycle Time (ns)	Parity or ECC	Data Bus/ Address (bits)	Distinguishing Features
320	420	P	8-16/24	
300	500	E	8-16/24	
430	660	-	8-16/16	128, 256 and 512 Kbyte have 110ns Access, 400ns Cycle and up to 24-bit address. Also Parity and ECC. 12 mo warranty.
430	660	-	8-16/16	48 and 64 Kbyte version have 400ns Access, 500ns Cycle. 4 Kbyte has parity and 64K ECC.
450	650	ECC	8-16/16-20	Error detection and correction is a delete option; 128K version is available with and without EC. Dynamic memory mapping; allows 8-bit system to access 16 Mbyte.
480	560	P	8-16/20	MMU is software compatible with 64KB limited systems, allows memory expansion to 1MB with no system modifications provides upward software compatibility to CP/M 3.0.
350	450	EEC	8-16/20-24	Can be set to 4K boundaries, logging of errors via I/O.
250	350	P	8-16/20-24	I/O control, byte locations of Parity error and interrupt.
360	430	P*	-/-	
270	290	-	-/-	Battery back-up standard.
330	-	EDC	-/24	Battery back-up.
250	330	-	8-16/-	
210	300	P	8-16/-	
250	330	-	8-16/20	
325	700	E	-/24	Battery backup optional.
195	300	P	-/-	
300	500	E	8-16/20	Byte swapping; two board set; +5V only.
414	489	-	8-16/20	Byte swapping for compatibility with 8086 systems.



**IRONOAK COMPANY**

3239 Caminito Ameca  
La Jolla, CA 92037  
(619) 450-0191

# The Multibus<sup>\*</sup> Buyers Guide

\*Multibus<sup>™</sup> is a trademark of Intel Corporation



## Static RAM

Central Data Corporation  
Comark Corporation  
CYB Systems, Inc.  
Datacube, Inc.  
Densan Co., Ltd.  
Distributed Computer Systems  
Diversified Technology, Inc.  
Electronic Solutions  
EMM/Sesco  
Heurikon Corporation  
Intel Corporation  
Intersil Systems  
National Semiconductor Corp.  
NEC Electronics U.S.A.  
Plessey Microsystems  
Relms  
Stynetic Systems, Inc.  
Thomas Engineering Co.

## Static RAM

Manufacturer	Model	DFA	Deliv.	Capacities (Kbytes)/Price						
				4	8	16	32	48	64	128
Central Data Corp. .... (217)359-8010	BI035/32K	★4/83	stk	-	-	-	\$820	-	-	-
Comark Corporation .... (617)894-7000	MR 80-8C	1/79	-	-	\$495	\$795	\$1295	-	-	-
Cyb Systems, Inc. .... (512)458-3224	16KE	9/82	-	-	-	\$480	-	-	-	-
Datacube, Inc. ....	CM-118	80	stk	-	-	-	\$810	-	-	-
	CM-118SL	80	stk	-	-	\$760	-	-	-	-
Densan .....	DSB-016	-	-	-	-	*	-	-	-	-
Distributed Computer .... (617)899-6619 (800)225-4589	DCS/SM16	-	-	-	-	\$450	\$850	-	-	-
Diversified Technology .... (601)856-4121	CBC 064	8/82	stk	-	-	\$551	\$704	\$855	\$996	\$2933
Electronic Solutions .... (714)292-0242	RAM-4C	-	stk	\$370	\$400	\$450	\$550	-	-	-
	RAM-16S	-	stk	-	-	\$390	\$475	-	-	-
	RAM-4	-	stk	\$325	\$345	-	-	-	-	-

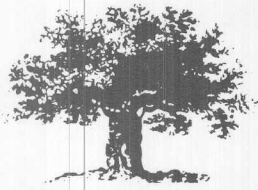


## Static RAM

Manufacturer	Model	DFA	Deliv.	Capacities (Kbytes)/Price							
				4	8	16	32	48	64	128	
EMM/Sesco .....	SECS 80/116	-	-	-	-	\$1800	-	-	-	-	
Heurikon Corporation ..... (608) 271-8700	MLZ-8/16	-	stk	-	-	\$595	\$895	-	-	-	
Intel Corporation ..... See Sales Office Listing	iSBC 301	-	-	\$325	-	-	-	-	-	-	
	iSBC 302	-	-	-	\$450	-	-	-	-	-	
Intersil Systems ..... (408) 743-4599	MCB-364	11/82	-	-	-	-	-	-	o	-	
National Semiconductor .....	BLC-8302	-	-	-	\$400	-	-	-	-	-	
NEC Electronics U.S.A. .... (617) 655-8833	BP0200	6/80	stk	-	\$1145	\$1300	\$1375	-	-	-	
	BP0220	9/80	stk	-	\$1075	\$1235	-	-	-	-	
Plessey Microsystems ..... (301) 279-2892 (800) 368-2738	PSM 6463-1	3/81	stk	-	-	\$695	\$900	-	\$1375	-	
Relms .....	rMEM 16K-BES	-	-	-	-	\$545	-	-	-	-	
Stynetic Systems, Inc. ....	NVR 8010	1/82	stk	-	\$695	-	-	-	-	-	
Thomas Engineering Co. ....	MZ-MMBsp	6/82	-	-	-	-	\$645	-	-	-	

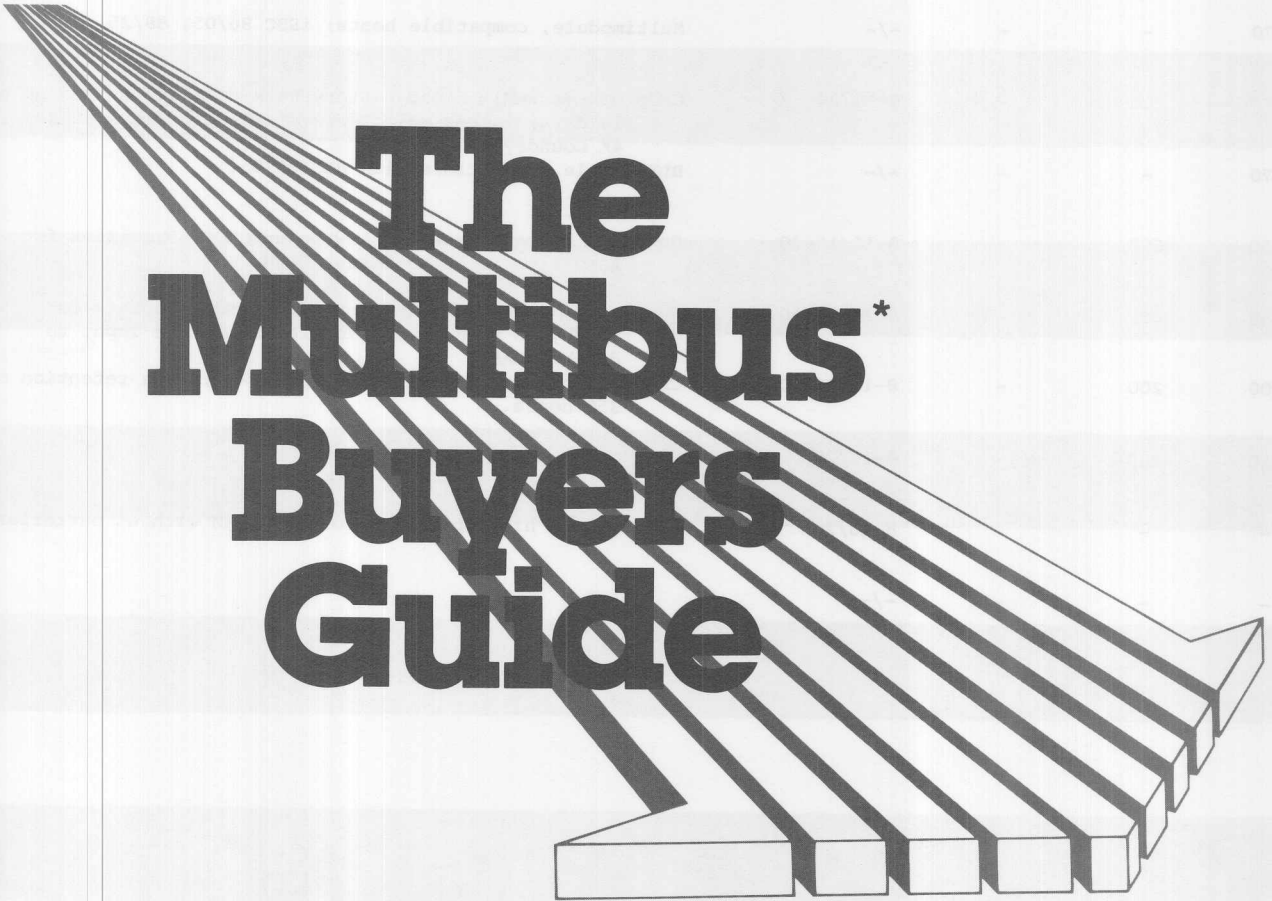


Access Time (ns)	Cycle Time (ns)	Parity or ECC	Data Bus/ Address (bits)	Distinguishing Features
385	-	-	-/-	MIL-Spec.
-	-	-	-/-	Sockets for 4K or 8K EPROM.
150	-	-	-/-	Multimodule, compatible hosts; iSBC 80/24, 88/40.
70	-	-	-/-	Multimodule, compatible hosts; iSBC 86/05, 88/25.
270	350	-	8-16/24	CMOS static RAM; NiCad battery back-up retains data up to 14 days; jumper selectable starting address at any 4K boundary.
70	-	-	-/-	BLX module, compatible with BLC-86/05.
450	600	-	8-16/16-20	On-board battery back-up; low power CMOS. Provision for ACLO line input to disable RAM.
450	600	-	8-16/16-20	On-board battery back-up; low power CMOS; sockets for 32 Kbytes PROM; provision for ACLO line input to disable RAM.
200	200	-	8-16/16-20	CMOS RAM on-board NiCad battery back-up; data retention of 350 hours.
150	260	-	8-16/20	
-	-	-	8-16/20	Includes 1K high speed non-volatile RAM without batteries.
-	-	-	-/-	



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(619) 450-0191



# The Multibus<sup>\*</sup> Buyers Guide

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## RAM/ROM

Central Data Corporation  
Datacube, Inc.  
Densan Co., Ltd.  
Electronic Solutions  
EMM/Sesco  
ETI Micro  
Megalogic Corporation  
Monolithic Systems Corp.  
NEC Electronics U.S.A.  
Sibthorp Systems, Inc.

## RAM/ROM

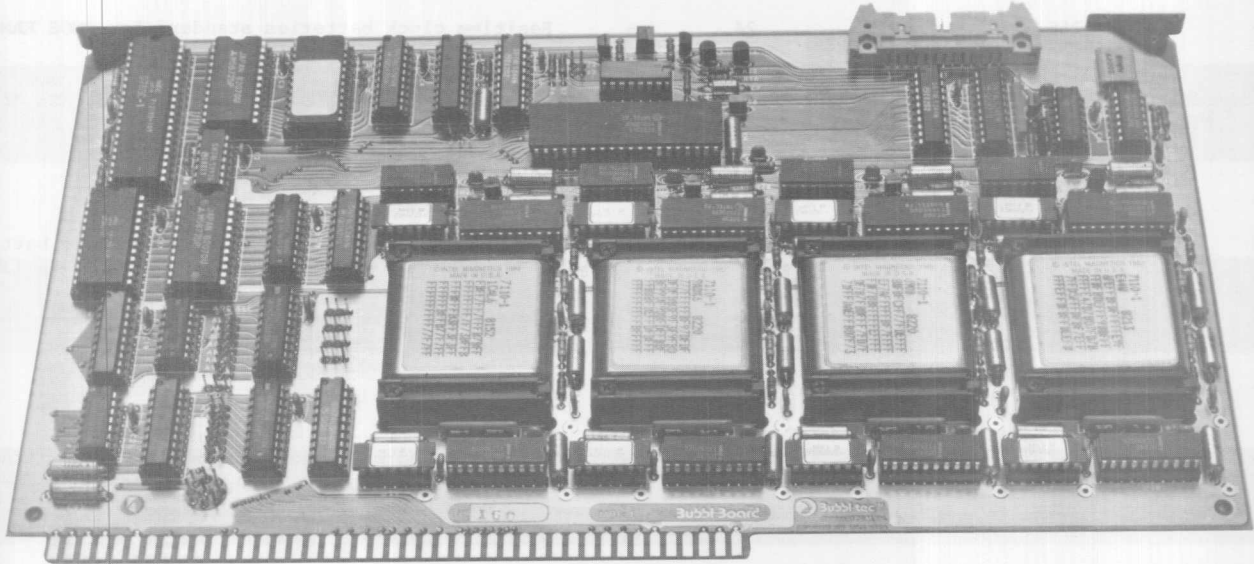
Manufacturer	Model	Price	DFA	Deliv.
Central Data Corp. .... (217) 359-8010	BI035	\$570	★4/83	stk
Datacube, Inc. .... (617) 535-6644	CM-126A	\$595	81	stk
Densan .....	DSB-416	\$-	-	-
Electronic Solutions .... (714) 292-0242	RAM/PROM 4C	\$390	-	stk
	RAM/PROM 4S	\$325	-	stk
EMM/Sesco .....	SECS 80/164	\$-	-	-
ETI Micro .... (415) 829-6600	8104	\$385	3/81	stk
Megalogic Corporation .... (513) 833-5222	PAM-1/ES	\$295	-	stk
Monolithic Systems .... (303) 770-7400	MSC 4602-04	\$543	-	-
	MSC 4802-16	\$698	-	-
NEC Electronics U.S.A. .... (617) 655-8833	BP0220	\$1075	9/80	stk
Sibthorp Systems, Inc. .... (606) 525-1300	BSM-102	\$495	3/81	stk



Max. RAM Cap./Supplied (Kbytes)	Max. ROM Cap./Supplied (Kbytes)	Data Bus (bits)	Address (bits)	+5V Only	Distinguishing Features
32/-	256/-	8-16	24	-	Realtime clock batteries standard for CMOS RAM.
Any combination to .5 Mbyte		8-16	20	o	32 sockets for 15 generic memory types, MOS or bipolar, from 4K to the latest 128K bit products.
8/-	8/-	-	-	-	16 sockets 2708 or 2716.
28/4	28/-	8-16	20		CMOS RAM/PROM; includes 170 hour on-board battery back-up. Wide range of capacities available.
28/4	28/-	8-16	20		Static RAM. Wide range of capacities available.
32/-	64/-	-	-		MIL-Spec.
32/-	64/-	8	20		16, 28 pin sockets, accommodates any Jedec standard memory; +5V only; selective battery back-up at each socket.
8/-	8/-	-	-		-5 volts for 2708 PROMS on-board.
16/- 64*	32/-	8	20		
64/- 128*	32/-	8-16	20		
16/-	32/-	8-16	16-20		On-board battery back-up; Low power CMOS; sockets for 32 Kbytes PROM; provision for ACLO line input to disable RAM.
64/-	128/-	8-16	16-20		Bank switchable in 16K or 32K blocks of like memory, banks may be overlapped, RAM's battery backable, 32 sockets, up to 128 Kbytes.

# Bubbl~Tec

## For Solid~State Mass Storage



### MAGNETIC-BUBBLE MEMORY SYSTEMS FOR:

- MULTIBUS
- LSI-11 & PDP-11
- STD-Bus
- VERSAbus
- VME Bus
- and others

### FEATURES:

- 100% solid-state
- Inherently non-volatile
- Designed for "real-world" environments
- Built-in intelligent controllers
- Fast operation
- Very low power requirements
- Expandable storage capacity



**Bubbl~tec**™

Division of PC/M Inc.

6800 Sierra Court

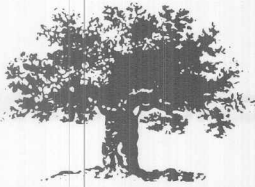
Dublin, California 94568

Telephone: 415/829-8700

TWX/Telex: 910/389-6890

## Nonvolatile Memory

Ampex Corporation  
Bubbl-tec  
Central Data Corporation  
Distributed Computer Systems  
Diversified Technology, Inc.  
EMM/Sesco  
General Digital Corp.  
Intel Corporation  
Intersil Systems  
Micro Memory, Inc.  
NEC Electronics U.S.A.  
Plessey Microsystems  
Schneider Instruments  
Stynetic Systems



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A series of parallel lines that converge from the left towards the right, creating a strong sense of perspective. The lines form a large, stylized arrow pointing to the right, which serves as a background for the title text.

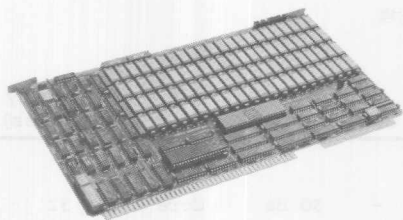
# **The Multibus<sup>\*</sup> Buyers Guide**

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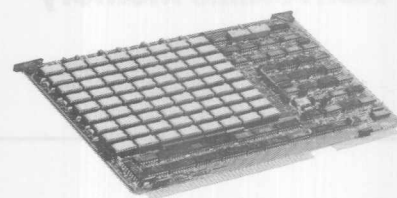
# MULTIBUS\* MEMORIES

## DYNAMIC RAM (IEEE P796-COMPATIBLE)



### MM-8086E

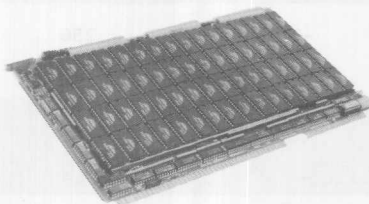
- 512K, 256K bytes
- Error detection and correction
- 1000<sub>H</sub> boundaries/16 Mbyte address
- Access/Cycle: 300/500 nsec
- CSR/ESR for EDC control and LED error correction indication
- Battery backup option



### MM-8086D

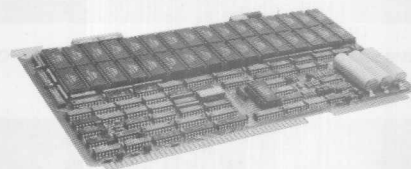
- 512K, 256K, 128K, 64K bytes
- For 8 and 16-bit processors
- 1000<sub>H</sub> boundaries/16 Mbyte address
- Even parity with output selectable to any of bus interrupts
- ACCESS/Cycle: 250/400 nsec

## NON-VOLATILE CMOS RAM (IEEE P796-COMPATIBLE)



### MM-8000C

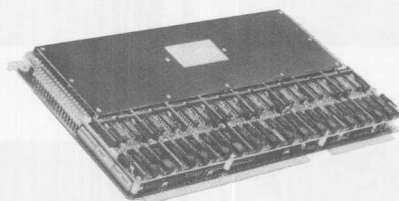
- 128K, 64K bytes
- Data retention (on-board batt.): 2 weeks rechargeable batteries
- 4000<sub>H</sub> boundaries/16 Mbyte address
- Access/Cycle: 220/220 nsec
- Battery status line allows monitored battery condition
- Redundant batteries provide improved reliability
- Accommodates 2716 EROM



### MM-8086C

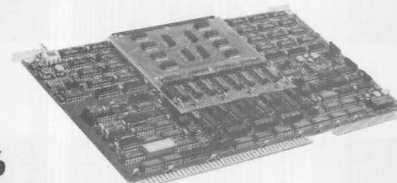
- 64K, 32K, 16K bytes
- Data retention (on-board batt.): 3 weeks rechargeable batteries 2 yrs. non-rechargeable batteries
- 1000<sub>H</sub> boundaries/16 Mbyte address
- On-board calendar/clock
- Access/Cycle: 250/250 nsec
- Redundant batteries provide improved reliability
- Accommodates 2716 EROM

## NON-VOLATILE CORE MEMORY



### MM-8086

- 32K bytes
- For 8 and 16-bit processors
- 1000<sub>H</sub> boundaries/1 Mbyte address
- Access/Cycle: 375/1200 nsec
- Power monitoring for data protection



### MM-8086/16

- 16K bytes
- For 8 and 16-bit processors
- 4000<sub>H</sub> boundaries/1 Mbyte address
- Access/Cycle: 280/800 nsec
- Power monitoring for data protection

ONE YEAR WARRANTY ON PARTS AND LABOR

ALL BOARDS TEMPERATURE-CYCLED AND BURNED-IN DURING MEMORY DIAGNOSTICS

**micro  
memory  
inc**

9436 Irondale Ave.  
Chatsworth, CA 91311  
Phone: (213) 998-0070

\*Trademark of Intel Corp.

## Nonvolatile Memory

Manufacturer	Model	Price	DFA	Deliv.	Type	Capacity (Kbytes)	Access Time (ns)	Data Retention
Ampex Corporation ..... (213)640-0150	MCM 8086	\$1995	-	30 da	Core	32 64*	425	inf.
	MCM 8080	\$840	-	30 da	Core	16	325	inf.
Bubbl-Tec ..... (415)829-8700	MBI-1	\$1729	9/82	-	Bubble	128 8M*	41msec	inf.
Central Data Corp. .... (217)359-8010	B1035	\$570	★4/83	stk	E <sup>2</sup> PROM	32	325	inf.
Distributed Computer ..... (617)899-6619 (800)225-4589	DCS/CM16	\$1200	-	-	ns	16	ns	-
Diversified Technology ..... (701)856-4121	CBC 256	\$4704	★3/83	-	CMOS RAM	256 128*	150	7 yr
	CBC 064	\$996	7/82	-	CMOS RAM	64 48,32,16*	250	7 yr
EMM/Sesco ..... (214)359-8010	SECS 80/264	\$-	mid-82	-	Core	64	650	-
General Digital ..... (203)528-9041	GDX-NVRAM-256	\$240	★10/82	stk	RAM/	1/2	300	-
Intel Corporation ..... See Sales Office Listing	iSBC 254 1A	\$1875	-	-	Bubble	128 512*	48msec	-
	iSBX 251	\$895	-	-	Bubble	128	48msec	-
	iSBX 251C	\$695	-	-	Bubble	128	48msec	-



## Nonvolatile Memory

Manufacturer	Model	Price	DFA	Deliv.	Type	Capacity (Kbytes)	Access Time (ns)	Data Retention
Intersil Systems ..... (408) 743-4599	MCB-332	\$934	5/80	stk	CMOS RAM	32	390	21da
MicroMemory, Inc. .... (213) 998-0070	MM 8086/16	\$875	12/80	10da	Core	16	280	inf.
	MM 8086	\$1275	12/79	10da	Core	32	375	inf.
	MM 8080B	\$790	1/79	10da	Core	8	325	inf.
	MM 8000C	\$995	7/82	stk	CMOS RAM	128	250	2wk
	MM 8086CC	\$825	5/82	stk	CMOS RAM	64	220	3wk
	MM 8086CN	\$825	5/82	stk	CMOS RAM	64	220	2yrs
NEC Electronics U.S.A. .... (617) 655-8833	BPO200	\$1145	6/80	stk	CMOS	16	450	7da
	BPO220	\$1075	9/80	stk	CMOS	32	450	7da
Plessey Microsystems ..... (301) 279-2892 (800) 368-2738	PSM 6463/00	\$1375	3/82	stk	CMOS RAM	64	200	8yr
Schneider Instruments ..... (513) 561-6803	E4K	\$575	6/79	stk	EAROM	4	650	10yr
Stynetic Systems ..... (513) 561-6803	NVR8010	\$695	10/81	-	E <sup>2</sup> PROM	8	-	inf.



Address Capability (bytes)	Data Bus (bits)	Address (bits)	Distinguishing Features
1M	8-16	20	Utilizes ultra low power 4K CMOS static RAM's; optional 2, 4, 8, 16K versions.
1M	8-16	20	16 Kbytes in single slot - Infinite data retentions <u>without battery back-up</u> .
1M	16	20	Infinite data retention without battery back-up.
64K	8	14	8 Kbytes core and 16 Kbytes EROM.
16M	8-16	24	On-board redundant Ni-Cad Batteries, rechargeable - Battery Status Line allows computer-monitored battery condition.
16M	8-16	24	On-board redundant Ni-Cad Batteries, rechargeable, also included is a Real Time Calendar Clock.
16M	8-16	24	On-board redundant Lithium Batteries, Data retention 2 years minimum.
1M	8-16	20	On-board battery back-up; provision for ACLO line input to disable RAM.
1M	8-16	20	On-board battery back-up; provision for ACLO line input to disable RAM; sockets for 32 Kbytes PROM.
1M	8-16	16-20	On-board Lithium Primary Cell backup; data retention 2 years minimum, 8 years typical, 25 years maximum.
4K	-	-	Non-volatile "read mostly" memory board; optional 1K, 2K, 3K.
8K	8-16	16-20	Full-speed non-volatile NVRAM without batteries, no wait states.

# The Multibus<sup>®</sup> Buyers Guide

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The Multibus interface, developed by Intel in 1977, was the first multi-processing bus architecture to have its physical and electrical specifications released to the public. Because the Multibus architecture provided well-documented specifications along with versatility and ease of use, the electronics industry quickly accepted the Multibus architecture as a de facto industry standard. In fact, the Multibus architecture has become so well-accepted that over 165 manufacturers now produce Multibus-compatible boards and backplanes.

The IEEE P796 Working Group was formed in 1978 and submitted a draft to the IEEE Computer Standards Committee in December 1980 to formally standardize the Multibus architecture. At the December 1982 meeting of the IEEE Standards Board the IEEE P796 became an official standard.

Copies of the IEEE 796 Standard may be ordered from:

IEEE Service Center, CP Dept.  
445 Hoes Lane  
Piscataway, NJ 08854

# (EP) ROM

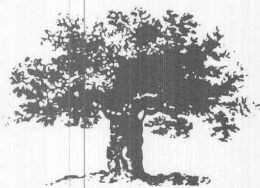
Central Data Corporation  
 Datacube, Inc.  
 Electronic Solutions  
 EMM/Sesco  
 Intel Corporation  
 National Semiconductor Corp.  
 One/D Corporation  
 Sibthorp Systems, Inc.  
 TSD Display Products

## (EP) ROM

Manufacturer	Model	Price	DFA	Deliv.	Capacity (Kbytes)	Access Time (ns)	Data Bus (bits)	Address (bits)
Central Data Corporation ..... (217)359-8010	B1014	\$225	2/80	stk	128	100+	8/16	24
	B1035	\$510	★4/83	stk	256	100+	8/16	24
Datacube, Inc. .... (617)535-6644	PM-116	\$265	80	stk	128	select	8/16	16 20*
Electronic Solutions ..... (714)292-0242	PROM-32/64	\$245	-	stk	64	21.5+	8/16	20
	EEPROM-32	\$495	-	stk	32	94	8/16	20
	PROM-16/32	\$195	-	stk	32	475	8/16	20
	PROM-64/256	\$275	-	stk	256	30	8/16	24
EMM/Sesco ..... SECS 80/132	SECS 80/132	\$3600	-	-	32	650	-	-
Intel Corporation ..... See Sales Office Listing	iSBC 340	\$140	-	-	16	select	-	-
	iSBC 341	\$150	-	-	64	select	-	-
	iSBC 428	\$695	★5/83	-	-	select	8/16	24
	iSBC 464	\$570	-	-	64	select	8/16	20
National Semiconductor ..... See Sales Office Listing	BLC-416	\$343	-	stk	16 32*	450	8/16	16
	BLC-464	\$570	-	stk	128	select	8/16	24
One/D Corporation ..... SPM512	SPM512	\$340	4/82	stk	512	select	8/16	20
Sibthorp Systems ..... (606)525-1300	MB-100-PROM	\$495	5/80	stk	128	175	8	16
TSD Display ..... (516)589-6800	M60155	\$525	4/82	stk	256	select	8/16	24

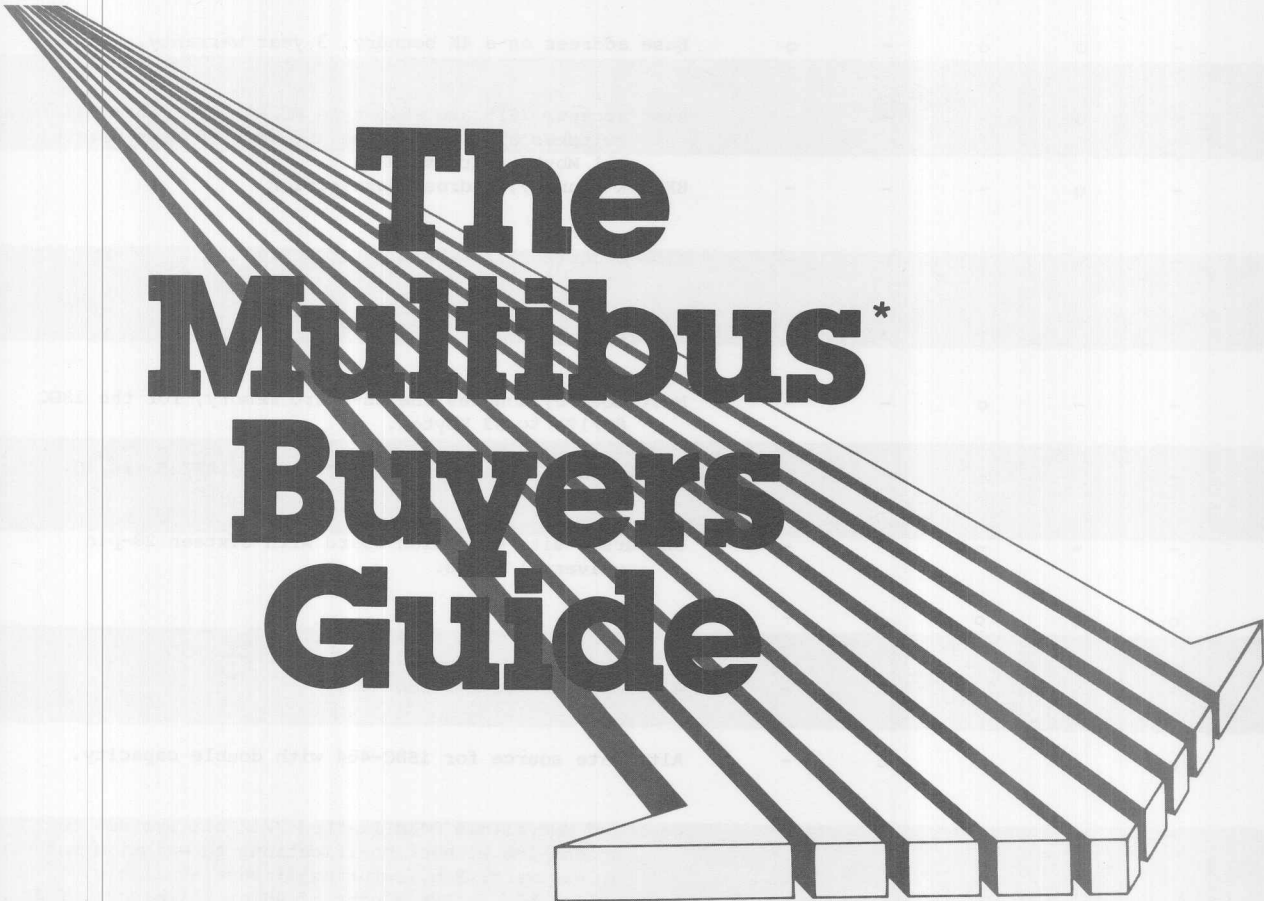


Compatible Devices						Distinguishing Features
2708	2758	2716	2732	2764	2532	
-	o	o	o	o	-	Two banks address independently.
-	-	o	o	o	-	Also uses 27128 and 27256, Realtime clock and battery back-up standard.
o	-	o	o	-	o	On-board -5 volt regulator.
-	-	o	o	-	o	Base address on a 4K boundry, 3 year warranty.
-	-	o	-	-	-	Also accepts 2815 and 2816 type EEPROMs; hexadecimal rotary switches allow easy page and base address selection in a 1 Mbyte address space.
o	-	o	-	-	-	8K/16K boundry, address deselection.
-	-	-	o	o	-	Also accepts 27128 EPROM.
-	-	-	-	-	-	MIL-Spec. Optional 2K, 4K, 8K, 16K.
-	-	-	o	-	-	Multimodule; doubles the on-board memory, for the iSBC 86/12A to 32 Kbytes.
-	-	-	-	-	-	Multimodule; expansion for iSBC 86/05, 88/25, 88/40.
-	-	-	-	-	-	Universal site expansion board with sixteen 28-pin universal sites.
-	o	o	o	-	-	
-	-	-	-	-	-	Alternate source for iSBC-416.
-	o	o	o	o	-	Alternate source for iSBC-464 with double capacity.
-	-	o	o	o	-	On-board MMU allows 64KB limited 8/16 bit systems to access 1MB without modifications to existing software or hardware; Manufacturing license available.
-	-	o	o	-	-	Bank switchable in 32K blocks of 4K or 16K blocks of 2K PROMs; Banks may be overlapped; optional 8 MHz on-board oscillator.
-	-	-	o	o	-	27138's may be used providing 512 Kbyte capacity.



**IRONOAK COMPANY**

3239 Caminito Ameca  
La Jolla, CA 92037  
(619) 450-0191

A graphic consisting of numerous parallel lines that converge from the left towards the right, creating a strong sense of perspective. At the bottom right, these lines form a 3D arrow pointing horizontally to the right.

# **The Multibus<sup>\*</sup> Buyers Guide**

\*Multibus™ is a trademark of Intel Corporation

## Combination Memory — I/O Expansion

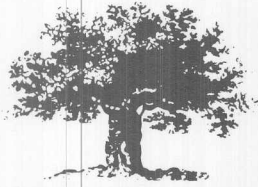
Advanced Micro Devices  
 Diversified Technology, Inc.  
 Intel Corporation  
 MBI, Inc.  
 Monolithic Systems Corp.  
 National Semiconductor Corp.  
 TITN, Inc.  
 TSD Display Products  
 Zendex Corporation

## Combination Memory – I/O Expansion

Manufacturer	Model	Price	DFA	Deliv.	Cap./Supplied (Kbytes)		Parallel I/O Lines
					RAM	ROM	
AMD ..... (408)988-7777	95/5132	\$695	-	stk	32/0	64/-	24
	95/5232	\$-		-	128/0	256/0	24
Diversified Technology ..... (601)856-4121	CBC8116	\$925	★2/83	-	16/16 8/8*	-/- 32/0*	22
Intel Corporation ..... See Sales Office Listing	iSBC 108A	\$980	-	-	8/8	32/-	48
	iSBC 116A	\$1185	-	-	16/16	32/-	48
MBI, Inc. .... (617)964-1399	MBZ-64	\$1650	-	-	64/64	32/-	20
Monolithic Systems ..... (303)770-7400	MSC 8103-16	\$780	-	-	8/8	16/-	48
	MSC 8104-30	\$1120	-	-	32/32	32/-	48
	MSC 8107-30	\$1200	-	-	32/32	32/-	24
National Semiconductor ..... See Sales Office Listing	BLC-104	\$780	-	-	4/4	8/-	48
	BLC-116	\$800	-	stk	16/16	8/-	48
TITN, Inc. .... (415)348-9181 (612)831-4422	TN68/18	\$995	7/82	6wk	8/8	-/-	48
TSD Display Products, Inc. .... (516)589-6800	M60141	\$700	-	stk	-/-	32/-	24
Zendex Corporation ..... (415)828-3000	ZX-118	\$1504	-	-	16/16	-/-	-

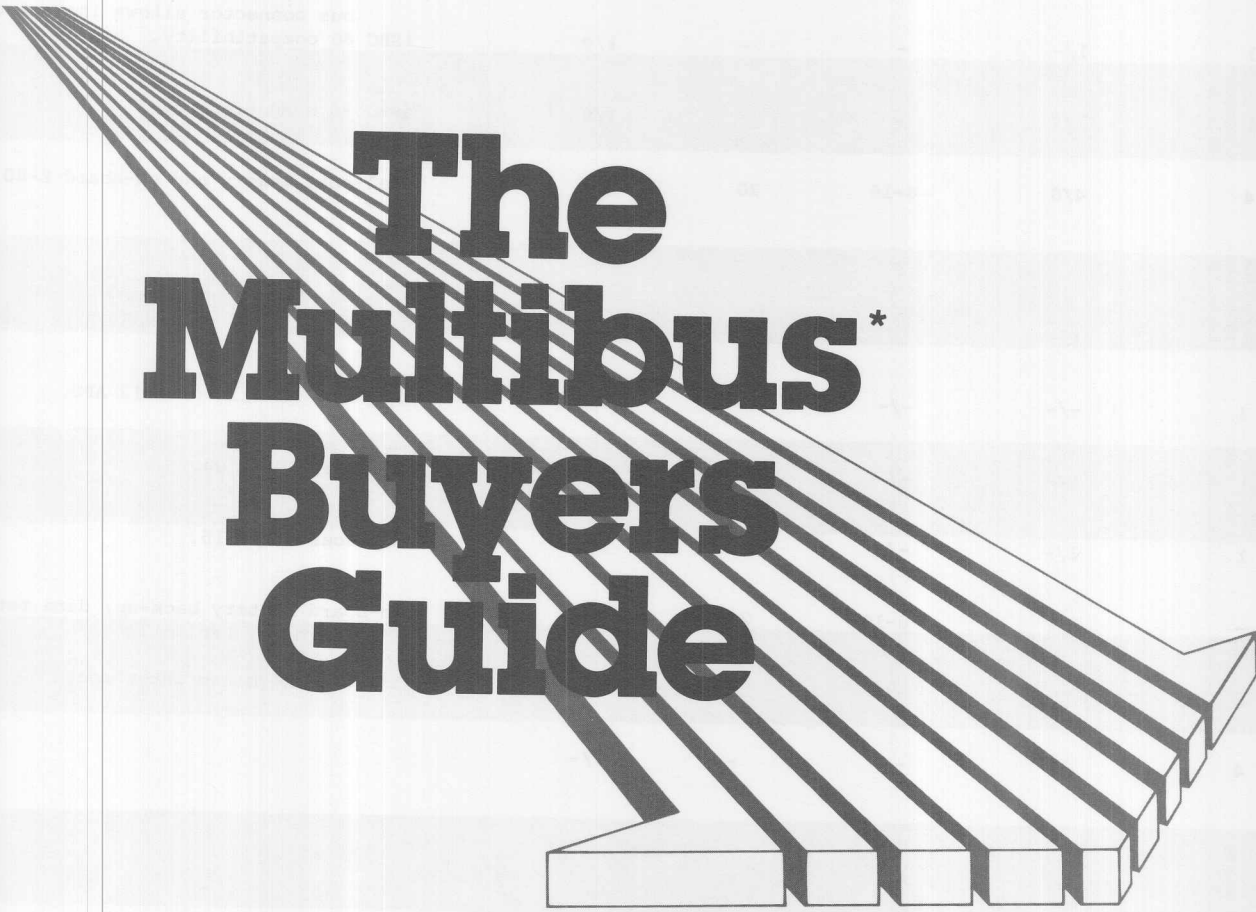


Serial I/O (RS-232)	Counter Timers (No./bits)	Data Bus (bits)	Address (bits)	Interrupt Levels/Sources	Distinguishing Features
1	1/-	8-16	20	1/9	Static RAM.
1	5/-	-	-	-/-	SBX connector, Sixteen 24/28 JEDEC sockets for byte wide RAM/ROM/EPROM.
2	2/16	8	16	3/10	Complete CMOS design for low power opera- tion; 540mW of power dissipation; CBX bus connector allows incremental expansion.
1	1/-	-	-	1/9	iSBC 86 compatibility.
1	1/-	-	-	1/9	iSBC 86 compatibility.
4	4/8	8-16	20	1/1	Dual-port memory and on-board Z-80.
1	1/-	-	-	-/-	
1	1/-	-	-	-/-	Includes socket for Am9511A or Am9512 APU.
3	-/-	-/-	-	-/-	Optional Am9511A or 9512 APU.
1	1/-	-/-	-	1/8	Replaces iSBC 104.
1	1/-	-/-	-	1/8	Replaces iSBC 116.
-	-	8-16	20	-/-	On-board battery back-up; data retention 10 days, typical.
2	3/-	-/-	20	7.7	Includes keyboard interface.
4	-/-	-/-	-	-/-	



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# The Multibus<sup>\*</sup> Buyers Guide

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## Serial I/O Expansion

Central Data Corporation  
 Christian Rovsing Corp.  
 Cosmos Systems, Inc.  
 Densan Co., Ltd.  
 Distributed Computer Systems  
 Intel Corporation  
 National Semiconductor Corp  
 NEC Electronics U.S.A.  
 Thomas Engineering Co.  
 TSD Display Products  
 Zendex Corporation

# The Multibus Buyers Guide

## SURVEY OF BUS STRUCTURES USED

Excerpt from Electronic News' survey on MPU chips and MCU boards dated 1982.

QUESTION: What bus structure do you use?

Total respondents 2351

<u>Bus Structure</u>	<u>% Respondents</u>
8080/Z80	25.7
6800/6802	20.6
MULTIBUS	20.0
8085	17.4
S-100	17.4
IEEE 488	13.5
STANDARD BUS	13.4
8048	9.4
8086	8.1
Q-BUS	7.9
6801/6809	7.7
UNIBUS	7.5
Z8000	5.3
VERSABUS	3.3
S-50	2.9
OTHER	23.5
NONE	6.6



# New I/O Boards with Locked In Reliability

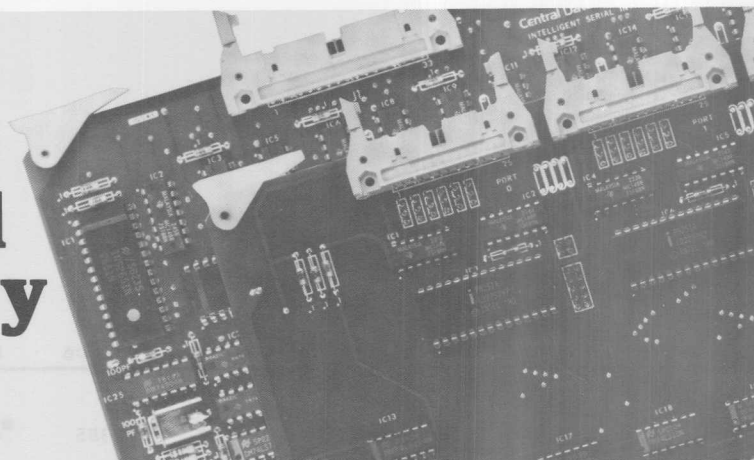
**And control, in  
Multibus\* boards  
from Central  
Data...now with  
built-in locking  
headers.**

**These new boards can help  
you save valuable produc-  
tion time and eliminate  
the need for hand solder-  
ing. Central Data's new  
locking headers allow  
direct connect from the  
boards to DB-25 connec-  
tors via flat cable.**

**Your  
Complete  
Multibus  
Source**

## Central Data Corporation

1602 Newton Drive  
Champaign, IL 61821-1098  
(217) 359-8010 TWX 910-245-9787



### **\$430** Multibus Flat Cable Intelligent Octal Serial Interface

Controlled by the signetics 2650 Microprocessor, this board now has 2661 USARTs (upgraded from the 2651). You can connect up to 8 EIA RS-232 ports to any Multibus system and the board is fully programmable to meet the needs of OEMs. Custom drivers are also available for any application. On-chip baud rate generators allow each of the Signetics 2661 USARTs to be set at a different speed ranging from 50 to 19,200 baud. 16K of dual port RAM buffers data in and out and the on-board processor handles all I/O interrupts, freeing time for the host processor. Up to 4K bytes of PROM can be on-board to control the processor. Cable control is built into the board with two 60-pin locking right angle headers. Each 60 conductor flat cable is split 4 ways (15 conductors each), giving you a total of 8 flat cable interconnects to standard DB-25 flat cable connectors.

### **\$250** Multibus Flat Cable Octal Serial Interface

Like the Intelligent Octal Serial Interface, this Multibus board has the 2661 USART and comes equipped with locking headers. Up to 8 EIA RS-232 interfaces can be added to any system and each interface is controlled by the Signetics 2661 USART with programmable baud rates up to 19,200. The board requires 32 I/O ports and the base address can be set to any multiple of 32 ports. The I/O addressing on the board can be 8-bit or 16-bit, with straps selecting the full range of interrupt capabilities. Any receiver full or transmitter empty condition can be used to generate an interrupt, which can be disabled by programming the USART accordingly.

### **\$180** Multibus Flat Cable Quad Serial Interface

Four 8251A USARTs provide parallel to serial conversion allowing the addition of up to four RS-232 interfaces to any Multibus system. For maximum flexibility in system design, baud rates and specifications for data transmission are totally programmable by the host computer. Three interval timers control each USART's baud rate of up to 19,200 baud. Full 16-bit dip-switch addressing is strap selectable, as is the full range of interrupt capabilities. And for convenience and performance, the board comes complete with four 26-pin locking right angle headers.

**OEM quantities and pricing are available on these boards and on Central Data's complete line of Multibus boards. For more information, call or write.**

\* Multibus is a trademark of Intel Corporation  
Prices shown are quantity 100.

## Serial I/O Expansion

Manufacturer	Model	Price	DFA	Deliv.	Type	No. Ports
Central Data Corporation ..... (217)359-8010	B1043	\$385	★4/83	stk	Octal Serial Interface	8
	B1038	\$280	★3/83	stk	Quad Serial Interface	4
	B1025	\$665	★4/83	stk	Intelligent Octal Board	8
Christian Rovsing Corp. .... (805)497-6722	SCI	\$-	-	-	Serial Communication Intfc.	4
Cosmos Systems, Inc. ....	-	\$-	-	-	8 Channel Serial I/O	8
Densan .....	DSB 532	\$-	-	-	Dual Serial Interface	2
Distributed Computer .....	COMBO I/O	\$650	81	-	Serial I/O Expansion	4
(617)899-6619 (800)225-4589						
Intel Corporation .....	iSBX 351	\$230	-	-	Programmable Serial I/O	1
See Sales Office Listing						
	iSBX 352	\$395	-	-	Programmable Serial I/O	1
National Semiconductor .....	BLX 351	\$230	-	stk	Programmable Serial I/O	1
NEC Electronics .....	BPO575-001	\$695	12/81	stk	Multi-channel Serial I/O	5
(617)655-8833						
Thomas Engineering Co. ....	MZ-SI08	\$800	6/82	-	Serial I/O Board	8
	MZ-MSIO	\$1000	6/82	-	Serial I/O Board	4
TSD Display Products .....	M60146	\$725	81	-	Programmable Serial I/O	5
Zendex .....	ZX-118	\$1495	-	stk	Quad Serial I/O Board	4
(415)828-3000						

## Distinguishing Features

EIA RS-232C ports; baud rates: 50 to 19, 200 baud; Requires 32 I/O ports; 8 or 16 bit addressing, Locking headers for pin compatibility with DB-25, also 2661 USARTs.

EIA RS-232C ports; programmable baud rates 75 to 19,200, 16 I/O ports. Locking headers for pin compatibility with DB-25.

2650 based intelligent controller; 16K dual-port RAM; up to 4K of PROM; RS-232C ports; 8-bit word size; 8 or 16-bit addressing; access time 450 to 900 ns; to 19,200 baud. Locking headers for pin compatibility with DB-25. Also 2661 USARTs.

280A based microcomputer board including a slave Multibus interface and four serial channels, supports 32K or 64Kbytes of RAM or PROM.

Eight independently programmable baud rates, user programmable interval timers.

Two channels, RS-232C or 20 mA, 75 to 4800 baud.

Serial I/O ports, timer counter and arithmetic processor or AM9511; RS-232C.

Buffered USART with 2 programmable BCD or binary timers; RS-232C or RS-422/449 interface. Multimodule.

HDLC/SDLC; Half/full duplex, point-to-point, multidrop or NRZI SDLC loop, RS-232C and RS-422A/449 interface, programmable baud rates to 64K baud.

Alternate source for ISBX 351.

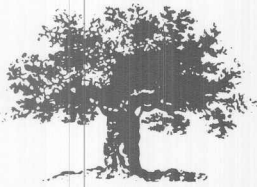
Adds 5 asynchronous serial channels; RS-232C or optically isolated 20 mA current loop.

Optional 20 mA current loop.

Includes 32Kbyte RAM.

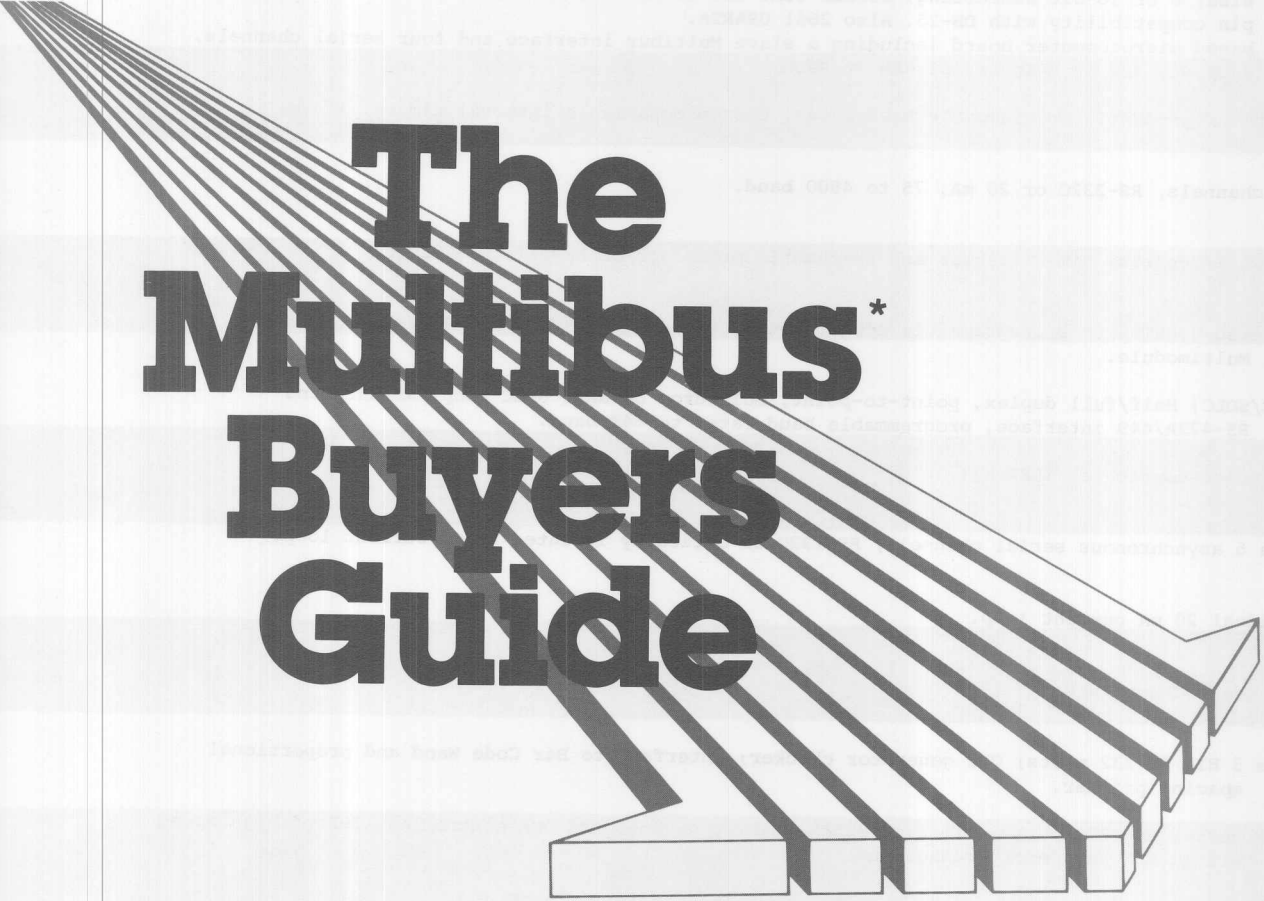
Adds 5 EIA RS-232 ports; CRC generator checker; interface to Bar Code Wand and proportional spacing printer.

Four serial RS-232C ports utilizing 8251A USARTs, an on-board DMA controller, 16K of high speed static RAM and memory management.



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## Parallel/Serial I/O Expansion

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Anitech Systems, Inc.  
Burr-Brown  
Densan Co., Ltd.  
Diversified Technology, Inc.  
Electronic Solutions  
EMM/Sesco  
ETI Micro  
General Digital Corp.  
GIC Systems  
Intel Corporation  
Inventive Systems  
J & H Manufacturing  
Matrox Electronic Systems  
Micro Industries  
National Semiconductor Corp.  
NEC Electronics U.S.A.  
Omnibyte Corporation  
Sibthorp Systems, Inc.

## Parallel/Serial I/O Expansion

Manufacturer	Model	Price	DFA	Deliv.	Parallel Lines			Serial Ports (RS 232)	Timers (No./bits)
					Input	I/O	Output		
Anitech Systems Inc. ....	1001	\$495	1/82	-	16*		16	-	-
Burr-Brown ..... (602) 747-0711	MP 801	\$335	-	-	-	-	16 32*	-	-
	MP 830-72	\$450	6/82	-	-	72	-	-	-
	MP 810	\$410	-	-	24	-	-	-	-
	MP 810-NS	\$335	-	-	24	-	-	-	-
Densan .....	DSB-519	\$-	-	-	-	72	-	-	1/-
Diversified Technology ..... (601) 856-4121	CBC 8517	\$780	★2/83	-	22	-	22	2	2/-
Electronic Solutions ..... (714) 292-0242 (800) 854-7086	SIM-64	\$395	-	stk	64	-	-	-	-
EMM/Sesco .....	SECS80/519	\$2700	-	-	-	72	-	-	-
ETI Micro ..... (415) 829-6600	8120	\$1240	8/81	stk	-	32	-	-	1/-
	8122	\$890	★83	stk	48*	-	48	-	-
General Digital ..... (203) 528-9041	GDX- Relay-8	\$120	9/82	stk	8	-	-	-	-
GIC Systems ..... (201) 743-6800	G519I/O	\$435	1/82	stk	-	72	-	-	3/16

### Distinguishing Features

Optically isolated, Memory or I/O mapped, 1.0 amp fused output.

600V isolation; 28V RMS, 0.5A reed relay.

72-channel TTL levels; user configured in 8-channel increments of inputs or outputs.

600V isolation; dry contact closure, 1.5mA wetting current at 24 VDC.

600V isolation; DC voltage input; 17 to 84 VDC; optional low DC voltage level, 1 to 5 VDC (TTL-compatible); AC voltage level, 65 to 250 VAC.

8 interrupt levels.

Complete CMOS design for low power operation; 540mW of power dissipation. CBX bus connector allows incremental expansion of I/O.

Detects up to 64 switch or relay inputs; input voltages to  $\pm 30$  VDC; optional terminating resistors; memory-mapped I/O.

MIL-Spec. version of iSBC 519.

Opto-isolated; high current drivers on 32 bi-directional lines; 8085A CPU; 2K dual-port RAM; transient voltage protected.

Opto-isolated (1500V) on-board 8088 with resident preprocessing firmware, 4Kbytes of dual-port RAM.

8-bit isolated relay port expansion module. Sockets for user-supplied DIP relays. Form A or C switching. Use as uP controlled switches, relay scanner or matrix switching.

72 I/O lines; 24 mA current sink; includes 8253 timer, 8259A interrupt controller; +5V only.

continued next page

## Parallel/Serial I/O Expansion

Manufacturer	Model	Price	DFA	Deliv.	Parallel Lines Input I/O Output	Serial Ports (RS 232)	Timers (No./bits)
Intel Corporation ..... See Sales Office Listing	iSBC 569	\$800	-	-	- 45 -	1	3/-
	iSBC 517	\$470	-	-	- 48 -	1	1/-
	iSBC 519	\$550	-	-	- 72 -	-	1/-
	iSBC 589	\$1985	-	-	- - -	-	-
	iSBX 350	\$155	-	-	- 24 -	-	-
	iSBC 580	\$775	-	-	- - -	-	-
Inventive Systems .....	ISI-MPI	\$1995	9/82	-	32 - 32	-	-
J & H Manufacturing .....	20750	\$495	-	-	- 48 -	-	1
Matrox Electronic Systems .... (514) 735-1182	COM-1	\$-	-	-	- - -	-	-
Micro Industries .....	MIB 517	\$540	★6/83	-	- 48 -	-	-
(614) 895-0404							
National Semiconductor .....	BLX-350	\$155	-	stk	- 24 -	-	-
See Sales Office Listing							
	BLC-508	\$385	-	stk	32 - 32	-	-
	BLC-517	\$437	-	stk	- 48 -	1	1
	BLC-519	\$550	-	stk	- 72 -	-	1
NEC Electronics U.S.A. .... (617) 655-8833	BPO600	\$595	★12/82	stk	- 72 -	-	5/16
Omnibyte Corporation .....	OB68K230	\$450	3/82	-	- 96 -	N/A	4/24
Sibthorp Systems, Inc. .... (606) 525-1300	PIO-200	\$575	★12/82	stk	- 128 -	-	-



## Distinguishing Features

8085A processor for control algorithms and three UPI-41A peripheral interface processors;  
2K dual-port RAM; 3 timers.

8 maskable interrupt lines.

Programmable interrupt controller; jumper selectable interval time, (real time clock).

Intelligent DMA controller for Multichannel I/O Bus interfaces supervisor, controller or basic  
talker, listener capabilities; 8089 16-bit I/O processor; user command interface firmware  
package; 2 SBX connectors; intelligent.

Multimodule, parallel I/O expansion.

Multichannel bus to iLBX bus interface; iLBX busmaster and Multichannel I/O bus 16-bit talker/  
listener; data rates to 5.3 Mbytes/sec; address 16 Mbytes iLBX memory.

16 control lines; true full duplex mode.

512 bytes CMOS RAM with battery back-up; 8 levels of interrupt.

Eight interrupt request lines, combination I/O expansion board.

Parallel I/O expansion module, alternate source for iSBX 350.

Alternate source for iSBC 508.

1 serial sync/async. channel; baud rates to 38.4K, alternate source for iSBC 517.

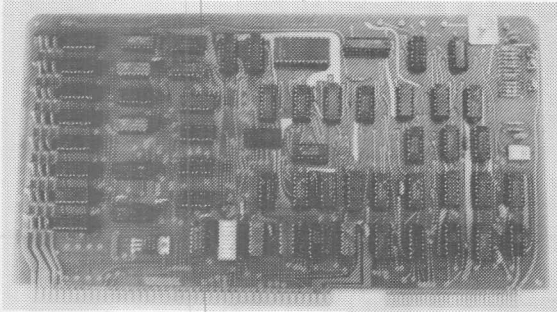
Programmable interrupt controller; plug replacement for iSBC 519, alternate source for iSBC 519.

iSBC 519 superset; on-board provision for custom signal termination/drive; user expansion area;  
time-of-day clock.

Software programmable for 8/16/32-bit I/O ports. 45% prototyping area.

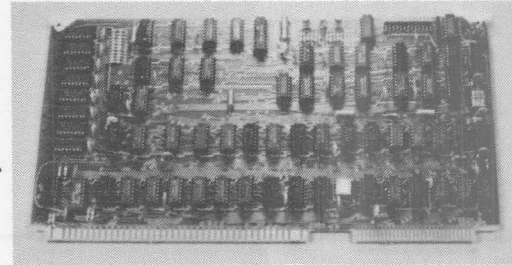
High speed; low power consumption. 16 8-bit ports. Memory mapped, (8/16/20-bit address), or  
I/O mapped (8/16-bit address). Two ports may be bi-directional, Opto 22 compatible  
interface.

# MULTIBUS\* GRAPHICS BOARDS *and more!*



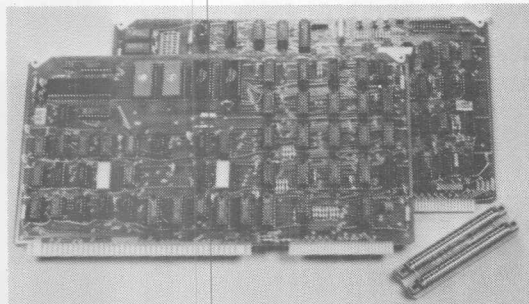
**\$495**

**RG-GG1 256H x 240V Graphics Generator.**  
Features dual refresh memories, fast hardware vector generator, simple I/O mapped instruction set. Outputs non-interlaced composite and TTL video for B&W, 525/60hz.



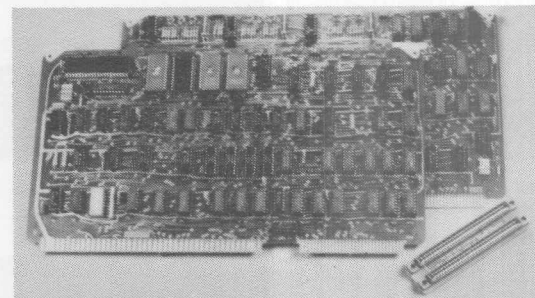
**\$595**

**RG-GG5 512H x 480V Graphics Generator.**  
Features dual refresh memories, fast vector generator, vertical scrolling, refresh memory readback, simple I/O mapped instruction set. Outputs interlaced composite and TTL video for B&W, 525/60hz.



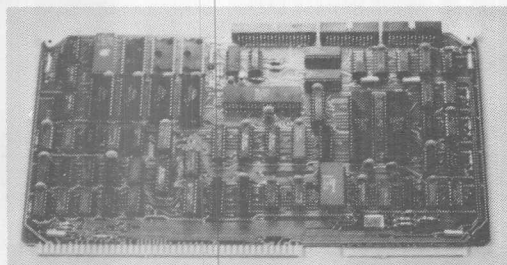
**\$1295**

**RG-GG7 512H x 480V Graphics Generator.**  
Features smart vector generator, dual refresh memories, variable size 5 x 7 and 7 x 9 characters sets, point to point draw from coordinate list, circles, rectangular fill, vertical scrolling, refresh memory readback, cursor, light pen interface, & a built in test display. Composite & TTL outputs, 525/60 or 625/50hz.



**\$1695**

**RG-GG6C 512H x 480V RGB Color Graphics Generator.** Features smart vector generator, dual sets of 3 memory planes, producing 8 colors, variable size ASCII characters, point to point draw from coordinate list, circles, rectangular fill, and a built in test display. Outputs 3 composite & TTL video signals, 525/60hz.



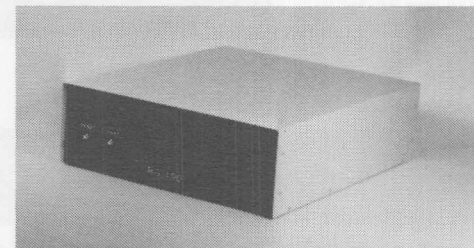
**\$595**

**RG-801 SINGLE BOARD COMPUTER.**  
Features a 4Mhz Z80A<sup>+</sup>, 2 RS-232C Ports, 1 Parallel port, 8 interrupts, 8k of static ram, Sockets for 16k of 2732 eproms, Multimaster capability, and a BUILT IN DEBUGGER with an execution trace, disassembler, breakpoint, hex upload & download, auto baud, and memory examine and modify commands.

## **RG-802 SINGLE BOARD COMPUTER.**

Features a 4Mhz Z80A, 64k of ram, 4k shadow prom with boot for CP/M<sup>++</sup> 2.2, Double Density Floppy Disc Controller, 2 RS-232C Ports, and 8 interrupts. A complete CP/M computer on one card. .... \$ 995

**RG-6T TABLE TOP ENCLOSURE** with 6 slot card cage, 12a +5v, 3a +12v, 3a -12v, & fan. .... \$ 995



**\$1895**

**RG-100 512H x 480V STAND ALONE RGB COLOR GRAPHICS GENERATOR.** Features RS-232C link to host computer, upload & download in Intel hex or binary format, generates variable size ASCII characters, point to point draw from coordinate list, rectangular fill, & circles. Outputs three composite RGB signals as well as TTL video and sync, producing 8 colors, 525/60hz.

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P.O. BOX 23334  
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TEL. (503) 620-2241

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+ Z80A IS A TRADEMARK OF ZILOG CORP.  
++ CP/M IS A TRADEMARK OF DIGITAL RESEARCH CORP.

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Scion Corporation  
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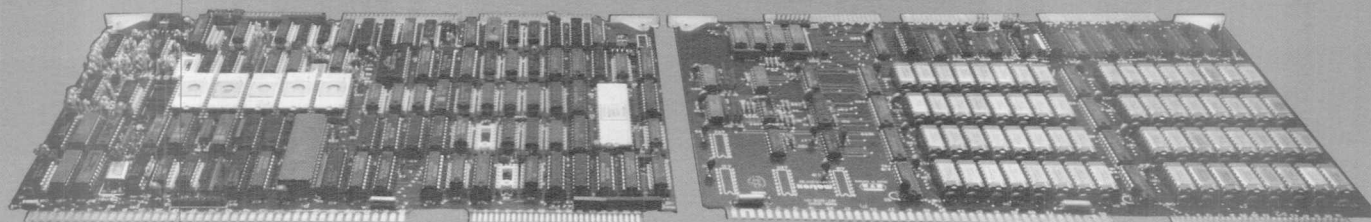
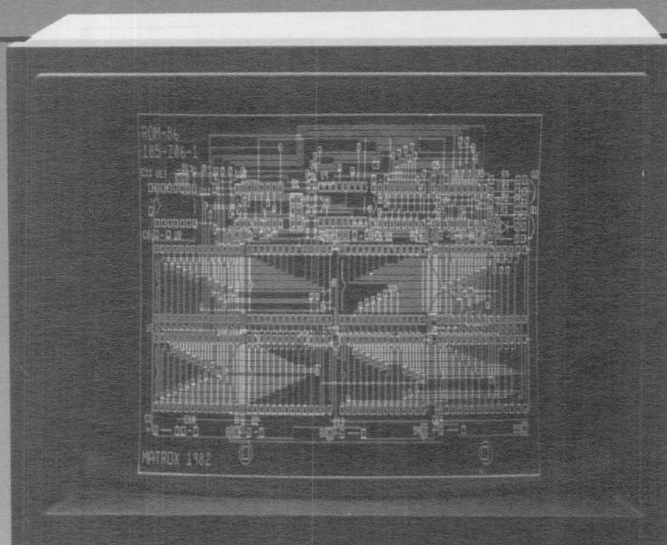


# COLOR GRAPHICS BOARDS 1024 x 1024

■ BUILT-IN  
SOFTWARE

■ \$3225.00  
COMPLETE \*

■ MULTIBUS  
COMPATIBLE



## MATROX GXB-1000 - The complete color graphics solution.

**DISPLAY RESOLUTION:** 1024 x 768 pixels non-interlaced at 60Hz or up to 1600 x 1200 pixels interlaced at 30Hz

**READ/WRITE AREA:** 1024 x 1024 x 4 bits/pixel expandable to 1024 x 1024 x 16 or 2048 x 2048 x 4

**SPEED:** Four pipelined on-board processors draw graphics primitives at speeds of 50 to 800 nsec/pixel

**COLOR:** 16 display colors can be selected from a palette of 256 different shades

**SOFTWARE:** On-board 16 bit CPU with resident graphics software interprets over 256 commands and supports local segments, 2D primitives, tablet tracking, rubber banding, etc.

**MODULARITY:** GXB-1000 is fully Multibus compatible (IEEE-796), and operates from a single + 5V supply

Multibus - TM Intel \*QTY 100

The GXB-1000 is a complete color graphics display system implemented on two Multibus boards. The system executes a display file containing high level graphics commands, generated by the user's host CPU. The GXB-1000 includes all the necessary hardware and software to draw lines, polygons, circles, characters, etc.

The GXB-1000 represents true state of the art performance. The boards generate the highest display resolution available from a raster scan device. The multi-processor pipelined architecture provides the highest possible drawing speeds.

Over six man years of Matrox programming effort have gone into the development of the on-board graphics software. An extensive command set allows the user to construct complex images with a minimal number of host CPU instructions and time.

The unmatched performance and low cost of GXB-1000 make it the perfect solution for OEM color graphic displays. Additionally, Matrox can provide RGB monitors, CPU boards, memory boards, cardcages and keyboards for complete display system requirements.



**matrox**  
electronic systems ltd.

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### EUROPE

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Tel.: 01626-3850 Telex: 74341 MATRX NL



## Video Controllers

Manufacturer	Model	Price	DFA	Deliv.	Type	Lines	Cols.	Chart Matrix	Resolution H. x V. (pixels)
Artec Electronics ..	SBV-80	\$750	-	-	Graphics Controller EIA RS 170	15	32	9 x 7	256 x 240
Datacube ..... (617) 535-6644	VT 103	\$495	80	stk	Alphanumeric CRT/ Keyboard Controller	16	96	7 x 9	-
	VR 107A	\$540	79	stk	Alpha/Graphics	24 12	80 40	7 x 7 7 x 9	160 120-144
	VR 110A	\$450	79	stk	Alpha CRT Keyboard	16	64	7 x 9	-
	VG-120A	\$2495	81	stk	Graphics	-	-	-	320 x 240
	VG-220A	\$2495	81	stk	Graphics	-	-	-	640 x 240
	VG-120C	\$2595	81	stk	Graphics	-	-	-	320 x 240
	VG-220C	\$2595	81	stk	Graphics	-	-	-	640 x 240
	VG-121/ 221	\$3995	2/82	60da	Graphics	-	-	-	320 x 512 640 x 512
Forward Technology..	FT-1024	\$1496	2/82	30da	Graphics Controller	-	-	-	800 x 1024
General Digital .... (203) 528-9041	GDX- COLOR-1	\$245	*6/83	-	Color Alphanumeric/ Graphics	24	40	6 x 8	256 x 192
General Electric ...	ACCB	\$3125	7/82	-	Colorgraphics Controller	-	-	-	512 x 512
Heurikon Corporation (608) 271-8700 (800) 356-9602	MLZ-VDC	\$2995	*10/82	-	Alpha Graphics	-	-	-	640 x 480
Ikier Technology ... (617) 275-4330	HRG Series	\$1500	3/82	stk	Graphics Controller	-	-	-	512 x 512 x 2 1280 x 1024*
	HRG & MPC	\$6000	1/83	stk	Graphics Controller & Multiplane Controller	-	-	-	512 x 512 x 8 1024 x 1024 x 8*
	HRG-II	\$2400	*3/83	30da	Graphics Controller	-	-	-	512 x 512 x 4 1024 x 1024 x 4

B & W	Color	Data Bus (bits)	Address (bits)	Distinguishing Features
o	-	8	16	Light pen interface.
-	-	8	-	Full 96-character ASCII font; high density display.
-	-	-	20	Programmable display format; memory mapped raster-scan display.
-	-	-	-	
o	-	-	16/20	High-density video binary storage and re-generation.
o	-	-	16/20	Full computer access to storage; EIA spec video.
o	o	-	16/20	Internal or Gen-Lock video timing; input section optional.
o	o	-	16/20	
o	o	-	-	Similar to VG-120/220, plus line acquire; multiple boards; scroll; enhanced phase lock timing, dynamic reading of data while acquiring; software selectable sync. source.
-	-	16	-	1024 x 1024 x 1 frame buffer is a dual-ported memory with one port dedicated to video refresh.
o	o	8	N/A	iSBX Multimodule, low cost expansion module, color text and graphics controller, uses TI-9918A video display processor, multi-plane display (back-drop, pattern plane, 32 "sprite" planes), 15 colors plus transparent, Sixteen levels of hardware screen/character zoom, vector generation.
o	-	8-16	-	
o	o	8	24	On-card Z80A; optional FIFO buffer.
o	o	8	20	Optional Interlaced/Non-Interlaced format; output to video monitor via TTL digital video channel; controller capable of generating arcs, vectors, circles & rectangles; DMA block transfers, NEC7220.
o	o	8	20	RGB Output, 16M Color Palette, 2 overlay planes, Blink. Optional 1024 version max. output of 80MHz.
o	o	8	20	RGB Output, 4096 Color Palette, On-board 3 x 4 DAC, DMA. Optional 1024 version max. output of 80MHz.

continued next page

## Video Controllers

Manufacturer	Model	Price	DFA	Deliv.	Type	Lines	Cols.	Chart Matrix	Resolution H. x V. (pixels)
Imaging Technology .	FB-512	\$3995	4/82	-	Image Processor/Color Graphic Controller	-	-	-	512 x 512 x 8
	AP-512	\$2995	4/82	-	Analog Processor Module	-	-	-	-
	ALU-512B	\$2995	★4/83	-	High Speed Pipe-Line Video ALU	-	-	-	-
Intel Corporation ..	iSBX 275	\$995	-	-	Video Graphics Controller	-	-	-	256 x 256
See Sales Office Listing	iSBX 270	\$750	-	-	Alphamosaic CRT/Key-board Controller	24	80	5 x 7 6 x 8 7 x 9	-
Interphase Corp. ...	VMC 186	\$485	-	-	Alphanumeric/Graphics	24	80	5 x 7 7 x 9*	-
(214) 238-0971									
Intersil Systems ...	ICC-500	\$-	★11/82	-	Alpha Graphics	64	80	8 x 8	640 x 480
(408) 743-4599	ICC-1000	\$-	★1/83	-	Alpha Graphics	128	128	8 x 8	1024 x 1024
Logitech, Inc. ....	PY1024-GRP	\$1050	★12/82	2wk	Graphics Controller	-	-	-	640 x 848 640 x 480
(415) 326-3885									
Matrox Electronic ..	MSBC2480	\$520	-	-	Alphanumeric CRT/Keyboard	24	80	6 x 10 8 x 10*	-
(514) 735-1182									
	BW-Alpha	\$495	-	-	Alphanumeric CRT/Keyboard	48	132	-	-
	QV-2	\$1360	-	-	Alphanumeric CRT/Keyboard	24	80	-	-
	NSBC-512	\$-	-	-	Graphics Controller	-	-	-	512 x 512
	RGB-ALPHA	\$885	-	-	Color Alphanumeric Controller	60	128	-	-
	MSBC-512	\$1255	-	-	Graphics Controller	-	-	-	512 x 512

B & W	Color	Data Bus (bits)	Address (bits)	Distinguishing Features
o	o	-	-	The IP-512 is the only family of Realtime Image Processing Modules plug compatible with Multibus. Accepts RS-170 input and in 1/30 sec. stores a frame in a 512x512 Frame Buffer with up to 24 bits/pixel.
-	-	-	-	Precision front end with flash A/D, sample and hold circuitry. Digitized by a 6 or 8-bit flash A/D at 5 or 10 million samples per second.
-	-	-	-	Compatible with FB-512 & AP-512, supports 4FB-512 channels, 8 or 16-bit operand selection.
o	o	8	20	Displays 512x512 B&W or 256x256 8-color resolution; high level drawing commands with light pen interface.
o	o	8	20	Multimodule, keyboard and light pen interface; cursor control, reverse video blinking, underline, highlight and page or scroll mode.
o	-	18	20	Upper and lower case, reverse, half intensity, flashing and underline attributes; compatible with SBC 80 series and SBC 86/12.
o	o	8-16	20	Single board; simultaneous bit plane right; on-board color table look-up; software selectable lines-columns; 3 on-board D/A converters. Two boards in parallel increases pixel depth.
o	o	8-16	20	Same as ICC-500 except twice the resolution.
o	-	8-16	24	1024 x 1024 x 1 bit map. Hardware assisted and selective scroll (both H and V). Fully integrated interface for LogiMouse. Portrait or landscape display mode.
o	-	-	-	
o	-	-	-	Scroll, programmable character attributes.
o	-	-	-	Controls up to 4, 24 x 80 independent displays; 8/16 bit data transfers.
o	-	-	-	Variable resolutions graphics controller; vector plot.
o	o	-	20	256 user-defined characters; keyboard and light pen interface.
o	-	-	-	Variable resolution graphics controller; vertical scroll; x-y addressing.

continued next page



## Video Controllers

Manufacturer	Model	Price	DFA	Deliv.	Type	Lines	Cols.	Chart Matrix	Resolution H. x V. (pixels)
Matrox Electronic .. (514) 735-1182	GXB-1000	\$4520	*	-	Super High Resolutions Color Graphics				1024 x 768 x 4 1600 x 1200*
continued	RGB-256	\$1465/ 1675	-	-	Graphics Controller	(price depends on resolution)	-	-	256 x 256
	FG-01/835	\$ 895/ 2095	-	-	Graphics Controller	(price depends on bits/pixel)	-	-	256 x 256
	RGB-GRAPH	\$ 895/ 2520	-	-	Graphics Controller	-	-	-	512 x 512
	VAF-512	\$1155	-	-	Graphics Controller	-	-	-	512 x 512
Metacomp, Inc. .... (619) 571-1168	MCV-1023-1\$	995	1/80	stk	Alpha/Graphics	24 16 12	80 60 40	6 x 10 8 x 15 12 x 20	512 x 256 512 x 512* .
Micrographics Rsch..	GTL	\$1995	12/81	6wk	Alpha Graphics	25	80	5 x 7	640 x 500
Monolithic Systems.. (303) 770-7400	MSC 8102- 02	\$1095	-	-	Graphics Controller	-	-	-	640 x 480
	MSC 8105	\$-	-	-	Alpha CRT	24	80	-	-
National Semi-..... Conductor, See Sales Office Listing	BLC-8228	\$993	-	-	Alphanumeric CRT/ Keyboard	24	80	5 x 7	-
	BLC-8229	\$1214	-	-	Alphanumeric CRT/ Keyboard	25	80	7 x 9	-
NEC Electronics .... (617) 655-8833	BP1000	\$2495	3/82	stk	Graphics Controller	-	-	-	640 x 480
Phoenix Computer ... Graphics (318) 234-0063	1024-B4	\$3500	*10/82	30da	Alphanumeric/Graphics Controller	60	80	12 x 16	1024 x 1024 x 4 1024 x 1024 x 8* 2048 x 2048 x 8*



B & W	Color	Data Bus (bits)	Address (bits)	Distinguishing Features
o	o	-	-	Matrox Electronic Systems continued: Single +5V, on-board 8088 CPU.
-	o	-	-	16 level grey scale or 16 color graphic displays.
-	-	-	-	256 x 256 or 4-bit frame grabber; designed to work with RGB-256; allows user to freeze a live TV frame.
-	o	16	20	DMA; 128Kbyte refresh memory; hardware zoom, pan, scroll shift, 4 boards can be synchronized for up to 16-bits/pixel.
-	-	-	-	Adds high video to RGB-Graph.
o	-	8	20	Intelligent single channel alpha/graphics with software selectable multiple character sizes, 8085 based firmware for high-speed/intelligent slave operations. 512 x 256 resolution.
-	-	-	-	
-	-	-	-	RS-170 compatible; 2 boards; keyboard interface.
-	-	-	-	
o	-	-	-	On-board INS8080A; firmware editor with cursor; blink, blank, reverse, scrolling, editing.
o	-	-	-	
*	o	-	-	Raster scan color or black and white graphics; vector arc, rectangle, and graphics drawing; split screen zoom and panning, software selectable video formats; alphanumeric capability.
o	o	-	-	256 colors usable to 16.8 million color palette, zoom, dual direct memory access, 2 boards.

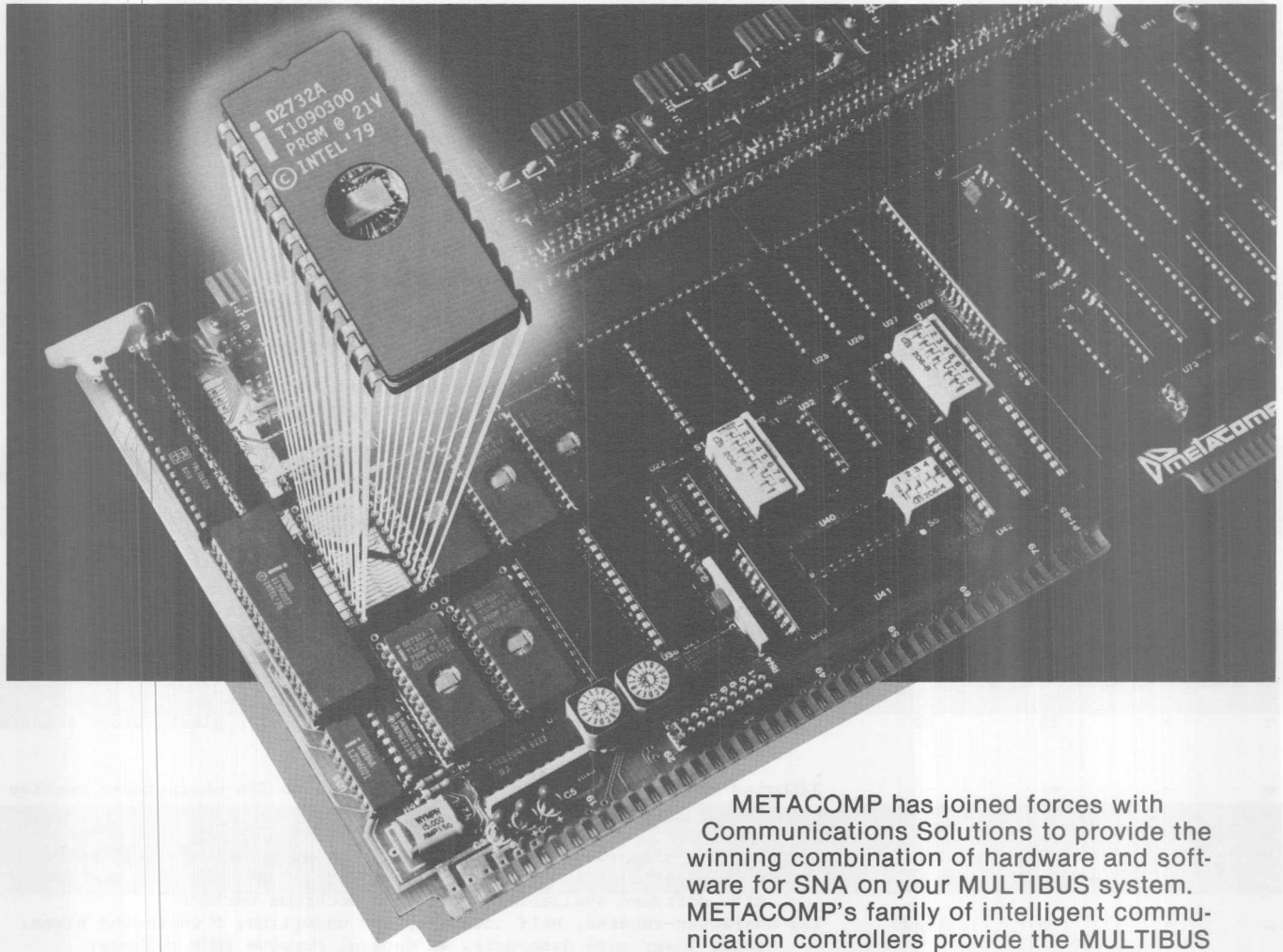
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## Video Controllers

Manufacturer	Model	Price	DFA	Deliv.	Type	Lines	Cols.	Chart Matrix	Resolution H. x V. (pixels)
Raster Graphics Inc. (503)620-2241	RG-SBC-GG1	\$495	6/79	stk	Graphics Controller	-	-	-	256 x 240
	RG-GG5	\$595	3/82	stk	Graphics Controller	-	-	-	512 x 480
	RG-SBC-GG2	\$1095	3/80	stk	Graphics Controller	-	-	-	240 x 480
	RG-SBC-GG3	\$1095	3/80	stk	Graphics Controller	-	-	-	512 x 480
	RG-GG6C	\$1695	12/81	stk	Graphics Controller	-	-	-	512 x 480
	RG-GG7	\$1295	6/82	stk	Graphics Controller	-	-	-	512 x 480
	RG-GG7C	\$2695	6/82	stk	Graphics Controller	-	-	-	512 x 480
	RG-GG7-4	\$3410	6/82	stk	Graphics Controller	-	-	-	512 x 480
	RG-GG8C	\$1895	★3/83	stk	Graphics Controller	-	-	-	512 x 480
Scion..... (703)476-6100	Micro-Angelo	\$1295	★10/82	-	Graphics Controller	40	85	-	512 x 480
TITN, Inc. .... (415)348-9181 (612)831-4422	TN/68-100	\$1595	-	6wk	Graphics Controller	-	-	-	572 x 864
TSD Display Systems. (516)589-6800	M60144	\$800	81	stk	Alpha CRT	24	80	-	-
Vermont Micro-..... Systems, Inc. (802)655-3800	VM8850	\$2562	8/82	stk	Graphics Processor	64 32	64 80*	5 x 7	512 x 512 640 x 480*
Xedax Corporation...	711-1	\$477	79	stk	Alphanumeric CRT/ Keyboard	24	80	5 x 7 7 x 10	1024 x 1024* 240 x 256
	711-2	\$451	79	stk	Graphics Controller	-	-	-	240 x 256

B & W	Color	Data Bus (bits)	Address (bits)	Distinguishing Features
o	-	-	-	Dual refresh memories, hardware vector generator; instructions written to I/O ports; composite and TTL; non-interlaced 525 output; writes at 1.6 usec/pixel.
o	-	-	-	Dual refresh memories, hardware vector generator; instructions written to I/O ports; interlaced; 800 nsec/pixel, vertical scroll, readback. 525.
o	-	-	-	Two board set, Smart vector generator creates ASCII characters, vector draw from endpoints, circles. Dual refresh memories. TTL or composite non-interlaced output. 525/625.
o	-	-	-	Two board set. Smart vector generator creates ASCII characters, vectors from endpoint, rectangular fill TTL & composite interlaced output for 525/625 line TV.
o	o	-	-	RGB color, RS-170 output. Two board set. Smart vector generator. Text and vectors. Dual refresh memories. 800 nsec/pixel. 8 shades of grey for B & W.
o	-	-	-	Two board set, smart vector generator, readback vertical scroll, dual refresh memories, circles, point-to-point draw.
-	o	-	-	4 board set, text & graphics, vertical scroll, readback, cursor, 5 x 7 & 7 x 9 character sets, user define character sets, 525/625, light pen I/O.
o	-	-	-	16 shades of gray, 5 board set, text & graphics, 2 character sets, scrolling, readback, light pen I/O.
-	o	-	-	Two board set, text & graphics, non-interlaced readback, vertical scrolling, TTL & RS-170 cursor, 2 character sets, Point-to point draw.
o	o	-	-	Single board graphics display computer.
o	-	16	20	Video: 625 lines, interlaced software access to each pixel. Block transfer at the byte level. Software available.
o	-	-	-	32Kbytes RAM; programmable DMA controller; up to 256 characters; reverse video; interrupt level options.
o*	o	8	16	Single-board graphics system; optional resident interpreter, 16 colors from palette of 4096; dual image buffers; CORE, GKS, GSX and VOI Std. software available. Optional monochrome version.
o	-	8	16/20	128 character-reverse, half intensity and underline; 5 character sizes; zoom, lower case desenders, 4K general purpose PROM sockets; interrupt or poll mode; memory-mapped 240 x 256 graphics.
o	-	8	16/20	Requires Xedax 711-1 Alphanumeric CRT Card.

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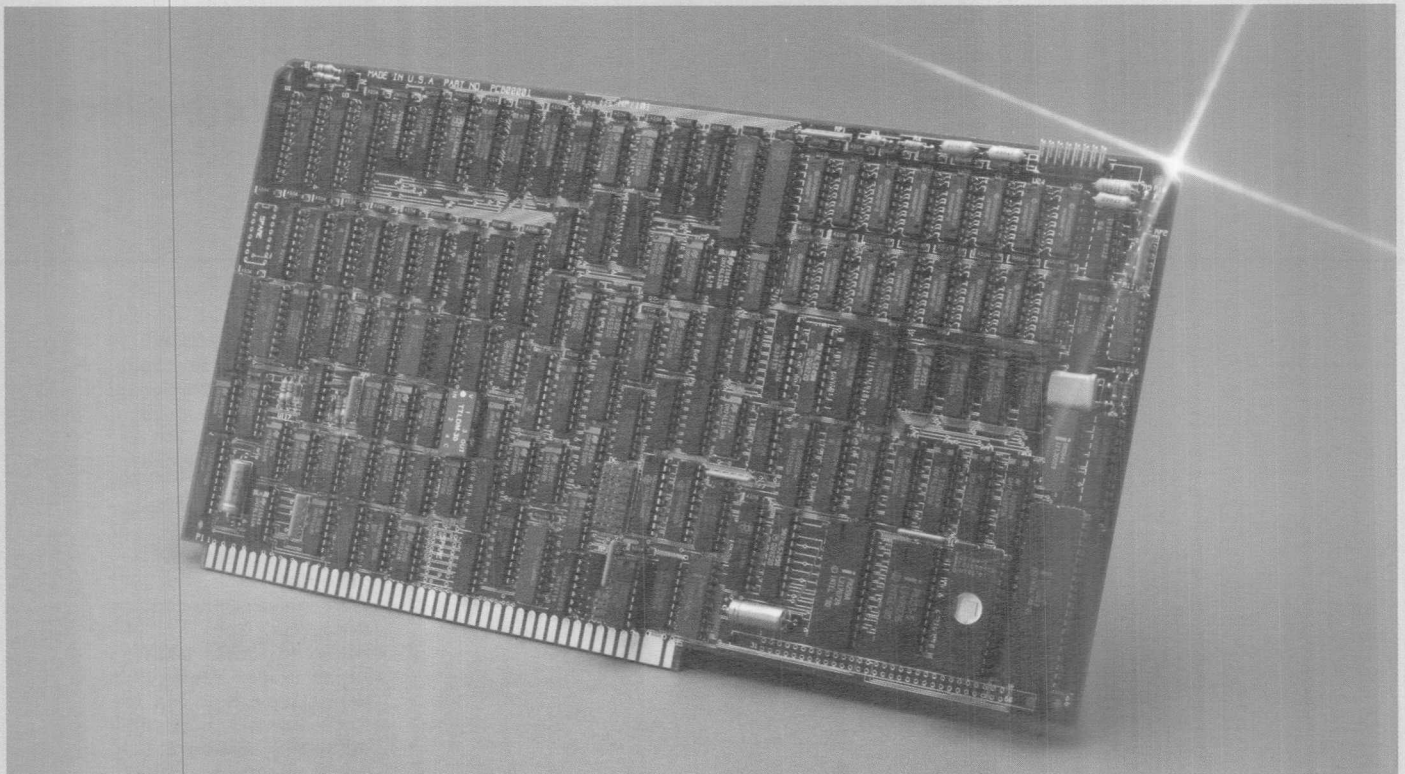


## Communications Controllers

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# A Complete LAN Communication Subsystem Designed for Easy Integration



## EXOS/101

### Ethernet® Front-End Processor • Single Multibus® Board

#### ● ON-BOARD HIGH-LEVEL PROTOCOL ENGINE

**16 bit processor**—8 MHz 8088

**64K or 128K RAM** for message buffering and high-level protocol software

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**16K PROM** containing the NX/101 with on-board diagnostics

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**Supports** OEM-ported protocols to protect previous investment

**Supports** planned Excelan-supplied protocols implementing ISO, and other architectures

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**Full hardware address recognition** including up to 256 contiguous multicast addresses filtered with 100% accuracy

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**Full power-up diagnostics** including internal loop-back that must be passed before network access is allowed

**Network Management** supported with statistics on CRC errors, collisions, timeouts, frame fragments received, alignment errors and queue overflows as well as error-free transmissions and receptions maintained and available to EXOS/101 and host processors

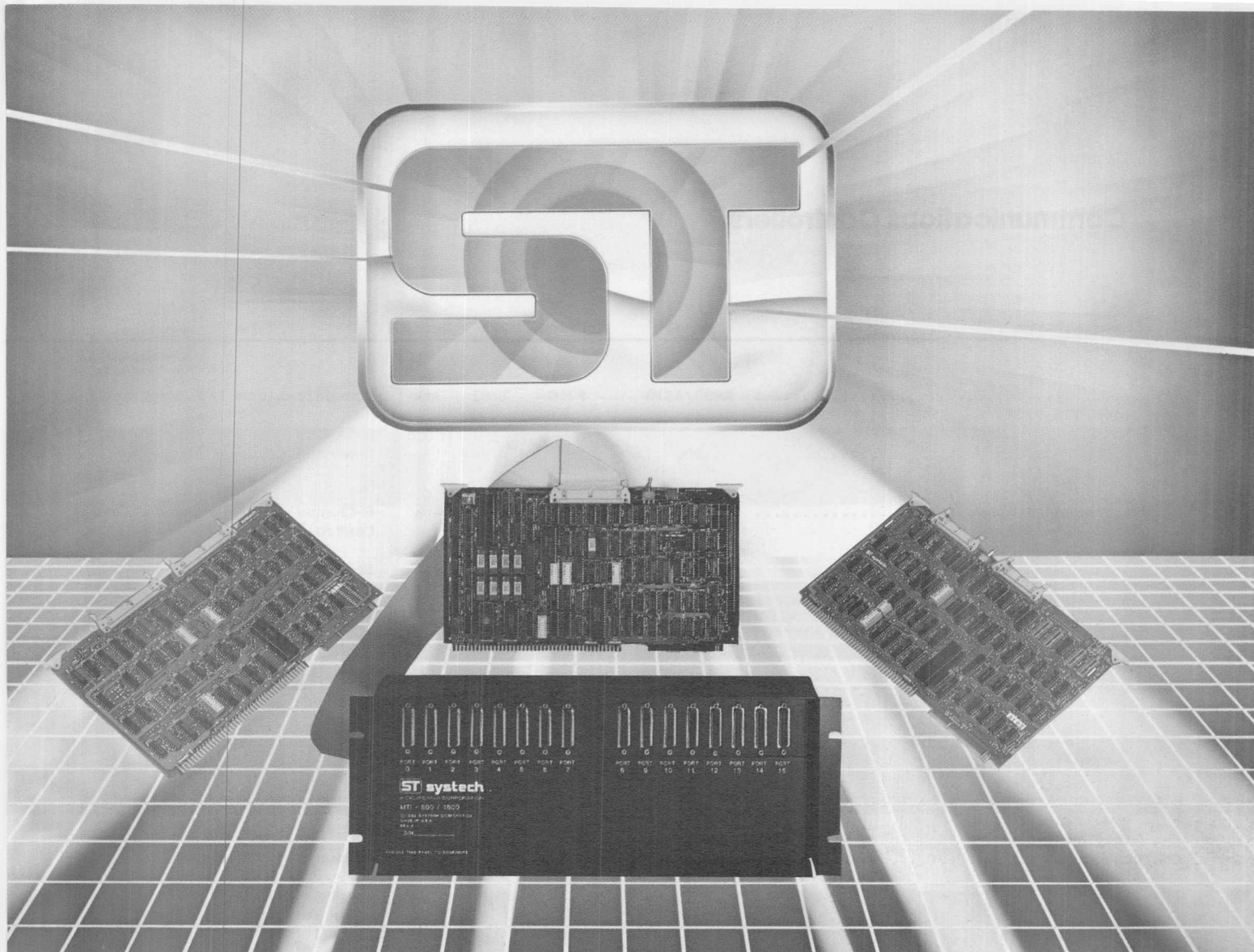
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Streamer Tape Controller

- Stores up to 45 MB of data in under 10 minutes
- Transfers up to 64KB without CPU intervention at 120 KB/Second
- Supports up to four drives



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- Supports Asynchronous and Synchronous communications
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- Contains extensive on-board self test and diagnostics

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DMA Dual Line Printer Controller

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## Communications Controllers

Manufacturer	Model	Price	DFA	Deliv.	Type
AMD ..... (408)988-7777	AM95/3310	\$710	1/81	stk	Communications I/O Expansion
Advant Corp. .... (408)947-8766	MS4300	\$-	★12/82	-	Baseband Network Controller
Bridge Communications, Inc. .... (408)446-2981	SIO	\$1600	★12/82	6wk	8-Channel Data Communications Controller
	EC/1	\$3000	★12/82	8wk	Ethernet Controller High Performance
Central Data Corp. .... (217)359-8010	B1025	\$650	10/81	stk	Communications I/O Expansion
Codata Systems Corp. ....	SCC0800	\$2250	★11/82	30da	Serial I/O Board
Comark Corporation .... (617)894-7000	MS534	\$550	12/81	-	Communications Controller
Distributed Computer .... (800)225-4589 (617)899-6619	-	\$1000	-	-	Communications Controller
EMM/Sesco .....	SECS 80/534	\$4900	-	-	Communications Controller
	SECS 80/544	\$6000	-	-	Communications Controller
	SECS 80/1553	\$8500	-	-	MIL-1553 Communications Interface
ETI Micro ..... (415)829-6600	8103	\$1020	8/81	stk	Communications Controller
	8140	\$1240	★83	stk	Communications Controller
Excelan ..... (408)945-9526	EXOS/101	\$1560	★1/83	stk	Ethernet Front-End Processor



# Distinguishing Features

Four fully programmable RS-232C channels; 24 input or output parallel lines; two timers/counters; Up to 4 modems and one Bell 801-type automatic call/answer unit.

Multi-user network interface for Intel Micro Development systems utilizing Advant MS 4100 Winchester disk system.

Uses 10MH3 68000, RS-232/423/422 Interface, synch, asynch, SDLC Protocol capability, iSBX connector, 2 Five channel timers, modem controls, 8, 9600 bps Full Duplex channels.

Uses 10MH3 68000, Large 128K Buffer for Back-to Back Pakets, implements Ethernet Version 1.0, Upgradable to IEEE 802 standard, serial port for down-loading, debugging, can run user protocol.

Eight EIA RS-232C channels, 2650 microprocessor controlled, 16K dual-port RAM.

Eight serial I/O channels, on-board SCC handles sync, asynch, monosync, bisync, SDLC and HDLC/ I/O handled by 4MHz Z80A uP w/64Kbytes of RAM.

Four channels RS-232C or opto-isolated 20mA current loop; auto-dial port; programmable baud rates; interrupt controller, 2 channel model.

Five port serial I/O; intelligent communications controller with 8088 microprocessor; DMA and HDLC/SDLC; local network capability, Intel 544 compatible.

Four fully programmable synchronous/asynchronous channels RS-232/422; MIL-Spec version of iSBC 534.

MIL-Spec. version of iSBC 544.

On-board 8085A; 2 RS-232C channels; 2 on-board Bell 202 modems; resident communications firmware; 8Kbytes dual-ported RAM; 16K/32K on-board RAM/EPROM.

Contains two RS-232C Ports, two modems, Bell 103/202, CCITT V.21, V.23; resident communications firmware, supports auto answer, auto rotary dial when used in conjunction with ETI Micro 8183 D.A.A. (FCC Part 68 registered).

EXOS/101 Ethernet<sup>C</sup> Front-End Processor -- Single Multibus<sup>C</sup> board with full Ethernet capability plus 16-bit 8088 processor, up to 128Kbytes of RAM, and NX/101 mini-operating system for running high-level protocol software supplied by OEM customers, Excelan, or third parties. Optional Model II w/128K RAM & 1795.

continued next page

## Communications Controllers

Manufacturer	Model	Price	DFA	Deliv.	Type
Intel Corporation ..... See Sales Office Listing	iSBC 550	\$2000	-	-	Ethernet Communications Controller IEEE 802 spec.
	iSBC 534	\$790	-	-	Four Channel Communications
	iSBC 544	\$1780	-	-	Communications Controller
	iSBC 88/45	\$1895	-	-	Advanced Communications Processor
	iSBX 352	\$395	-	-	Programmable Communications
Interlan, Inc. .... (617) 256-5888	NI3010	\$1390	2/82	30da	Ethernet Communications Controller Version 1.0 spec.
Interphase Corporation .....	LNC5180	\$1995	9/82	-	Local Area Network Controller
	MOT5100	\$495	-	-	Media Access Unit (modern)
	LNC5181	\$1995	-	-	X.25 Gateway
Metacomp, Inc. .... (714) 278-0635	MCS 1062	\$1960	12/81	stk	Communications Controller
	MPA 2000	\$2995	*3/83	30da	Intelligent Serial & I/O
	MPX 2000-XXX	\$-	*3/83	30da	Plug-in Modules for MPA 2000
Micro Digital Inc. .... (714) 891-2363	BCB-300	\$1250	6/81	30da	Communications Controller
Micro Industries ..... (614) 895-0404	MIB 534	\$910	*8/83	-	Four Channel Communications Controller



### Distinguishing Features

Provides data link and physical layer interconnection at 10 Mbit/sec data rate. On-board processor runs iNA950-1 transport software which offloads network intercommunication tasks from host.

Four fully programmable synchronous/asynchronous channels RS-232C or 20mA; 16-bit parallel I/O compatible with Bell 801 ACU; 16 maskable interrupt request lines.

On-board 8085A; 4 programmable synchronous/asynchronous channels RS-232C; 16Kbytes of dual-ported RAM; 10 programmable I/O lines-Bell 801 ACU.

Three HDLC/SDLC half or full duplex channels; optional: sync/async on 2 channels; DMA supports 800K baud operation, software.

HDLC/SDLC half/full duplex communications channel; point-to-point, multidrop, NRZI SDLC loop; RS-232C and RS-442A/449 interfaces; Programmable baud rates to 64K baud.

10 Mbits/sec data rate; data encoding and decoding.

Up to 255 Nodes/Network; 2 Mbit/sec data rate; HDLC/SDLC protocol; CRC-16 error detection; High speed DMA; 8-16 bit data bus; 24-bit address. Optional: LNC 5181 X.25 packet Network Controller.

75ohm coaxial transceiver, bus or star topology up to 3000 feet.  
Compatible with LNC 5180.

Supports X.25 both LAP and LAPB. Does all functions necessary to act as a stand along PAD. Geographically separated devices can be tied through public packet switching networks at data rates up to 56K baud.

Eight sync/async bit-sync channels with field interchangeable with RS-232C, RS-422/423 or current loop interface options. 8088 CPU with 96K EPROM, 128K RAM, 64K dual-ported, and interrupts. Hardware is iRMX-88 o.s. compatible. Software available. 24-bit address decode.

iAPX-186 CPU, 80130 OSF, 128K RAM with parity (64K dual-ported), 8 channels of on-board DMA. Low profile (non-SBX) plug-in modules available for various serial protocols, disk drives, parallel I/O. Can operate as Busmaster. MetaPaket architecture.

-110 4-channel I/O, async/sync/bisync, prog. baud rates; -120 2-channel DMA with async/bisync protocols; -130 2-channel DMA with SDLC protocols; -140 2-channel DMA with X.25 protocol; -210 16-bit full duplex I/O DMA interface between 2 Multibus systems; -310 disk controller.

On-board 8085. Four RS-232C channels. Four RS-366 auto-dialer channels. Binary messages up to 1500 bits. DMA with 20-bit address. 2K RAM. Up to 8K ROM.

Four RS-232C or optically isolated 20mA current loop buffered USART channels plus auto-call unit.

continued next page

## Communications Controllers

Manufacturer	Model	Price	DFA	Deliv.	Type
Monolithic Systems ..... (303)770-7400	MSC 8138	\$1025	-	-	Communications Controller
National Semiconductor ..... See Sales Office Listing	BLC-8545	\$1461	-	stk	Intelligent Communications Controller
	BLC-8538	\$890	-	stk	Eight Channel Communications Board
	BLC-8534	\$780	-	stk	Four Channel Communications Board
NEC Electronics ..... (617)655-8833	ADC0578	\$895	4/82	stk	Multi-Protocol Serial Controller
Procite Corporation ..... (206)392-0270	ARX-429	\$795	8/81	10wk	ARINC-429 Transceiver
Proteon Associates, Inc. .... (617)894-1980	HSBM/CTLM	\$3150	5/82	30da	Local Area Network Controller
Sibthorp Systems, Inc. .... (606)525-1300	MB-100-S10	\$1195	-	-	Serial Communications Board
Systech Corporation ..... (619)695-3420	MTI-800	\$1895	★12/82	stk	Eight Channel Serial Communications Controller
	MTI-1600	\$2395	★12/82	stk	Sixteen Channel Serial Communications Controller
3Com Corporation ..... (415)961-9602	3C 400	\$1250	5/82	45da	Ethernet Communications Controller Version 1.0 spec.
TITN, Inc. .... (415)348-9181 (612)831-4422	TN/68/38	\$795	81	6wk	Communications I/O Expansion
Xicom Technologies Corp. .... (613)238-4744 (415)924-1650	MicroNode	\$1500	★11/82	30da	SNA-Multibus Interface



#### Distinguishing Features

Eight RS-232C compatible sync/async channels at up to 19.2K baud.

Up to 4 channels of SDLC/HDLC/ADCCP or Bi-sync, half or full-duplex channels; Supports RS-232C CCITT V.24 or RS422/449 serial interfaces. SDLC firmware supplied - on-board CPU.

Eight RS-232 sync/async channels; error detection for each channel; baud rates to 19.2K.

Model control and error detection; equivalent to iSBC 534.

Eight full-duplex; 4 DMA driven channels and 4 interrupt driven; sync/async, HDLC/SDLC; CCIT and X.25 protocols; 3.2M baud aggregate throughput; requires BPO 188.

Double wide SBX MULTIMODULE; 8-16-bit; 2 receive channels and 1 transmit channel.

10 Mbit/sec data rate; token ring; twisted pair, coax or fiber optics; node-to-node separation 2km; full-duplex-host DMA interface; 255 nodes max; compatible with ISO; fail safe operation via PRONET wire center.

Four RS-232C or optically isolated 20mA current loop; Auto-Call-Unit interface; software programmable baud rates.

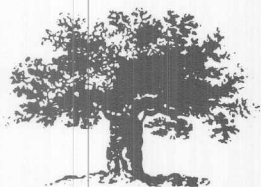
Intelligent DMA 8-channel serial I/O communications sub-system. Driven by sophisticated (factory supplied & supported) Time Division Multiplexing FIRMWARE. Asynchronous and Synchronous communications. Provides single character or block I/O commands. Contains extensive on-board self-test & diagnostics.

Intelligent DMA 16-channel serial I/O communications sub-system. Driven by sophisticated (factory supplied & supported) Time Division Multiplexing FIRMWARE. Asynchronous and Synchronous communications. Provides single character or block I/O commands. Contains extensive on-board self-test & diagnostics.

Single board; address recognition of addr. supplied by PROM or software; dual-ported memory; 20-bit addressing; transmit delay 1 usec, receive delay 3 usec; software setting of selective interrupts and error handling by hardware; 10 Mbit/sec.

Eight fully programmable RS-232C channels; 24 parallel I/O lines; 3 timers; 81T; opto-electronic isolators. Optional: V28 or TTL interface.

Requires Intel iSBC 88/45 communications processor board. Full SNA/SDLC type 2 Node Emulation.



**IRONOAK COMPANY**

3239 Caminito Ameca  
La Jolla, CA 92037  
(619) 450-0191

A series of parallel lines that recede into the distance, creating a strong sense of perspective. The lines are arranged to form a stylized staircase or a series of steps that lead towards the horizon.

# The Multibus<sup>\*</sup> Buyers Guide

\*Multibus™ is a trademark of Intel Corporation

## IEEE 488 (GPIB) Controllers

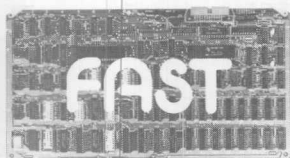
Densan Co., Ltd.  
Distributed Computer Systems  
Industrial Micro Applications, Inc.  
Information Development  
Intel Corporation  
National Instruments  
National Semiconductor Corp.  
Relms  
Zendex Corporation  
Ziatech Corporation



# The Multibus<sup>®</sup> Buyers Guide

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# ← IEEE 488 → for MULTIBUS<sup>TM</sup>



**The Hot Rod:** ZT 85/38 operates with DMA at speeds up to 250K bytes/sec. for demanding applications.



**The Brain:** ZT 80 relieves the CPU of GPIB overhead with its independent on-board microprocessor.



**The Miser:** ZT 85/18 performs the full set of GPIB controller functions at the lowest cost in the marketplace.

**You can count on getting your application up faster with Ziatech ← IEEE 488 → controllers. We provide driver software with example programs, cables, magnificent documentation and phone-in consulting by GPIB experts at no additional cost. Ziatech... builders of GPIB controllers for 6 years.**



## Ziatech Corporation

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San Luis Obispo, California 93401  
(805) 541-0488

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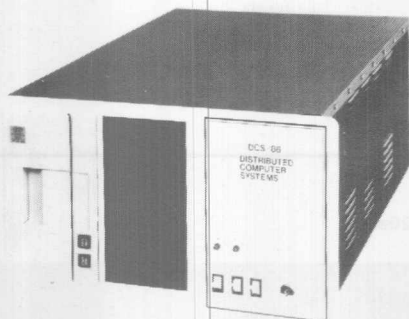
## IEEE 488 (GPIB) Controllers

Manufacturer	Model	Price	DFA	Deliv.	Data Rates (Kbytes/sec)		Compliance IEEE 796 Bus	Compatibility
					Prog. I/O	DMA		
Densan .....	DSB-581	\$-	-	-	-	-	-	-
Distributed Computer ..... (617)899-6619 (800)225-4589	DCS/488	\$750	-	-	-	250	-	-
Industrial MicroApplications Inc. .... (713)488-1171	IMA 488	\$1200	★12/82	stk	-	-	-	SBC86/88
Information Development .....	HS-488	\$895	80	-	40	-	-	-
Intel Corporation ..... See Sales Office Listing	iSBX 488	\$650	-	-	50	300	-	-
National Instruments ..... (800)531-5066	GPIB-796	\$1295	★2/83	stk	30	300-500	M:D8M24	S:D8I16VO
	GPIB-796P	\$650	★3/83	stk	30	-	-	S:D8I16VO
	GPIB-SBX	\$450	★4/83	stk	30	-	-	S:D8I16VO
National Semiconductor ..... See Sales Office Listing	BLC-8488	\$700	-	stk	256	125	-	-
Relms .....	rMEM-CLB	\$-	-	-	-	-	DB M24	-
Zendex ..... (415)828-3000	ZBX-488	\$500	-	stk	-	-	-	-
Ziatech Corporation ..... (805)541-0488	ZT85/18	\$595	5/82	stk 6wk	30	N/A	D16M20I16VO	SBC 80/XX,MDS 80
	ZT80	\$995	6/77	stk 6wk	N/A	6.5	D8M16VO	SBC 80/XX,MDS 80
	ZT85/38	\$1200	7/80	stk 6wk	30	250	D16M20I16VO	SBC 80/XX,MDS 80

Talker/Listener	Data Bus (bits)	Address (bits)	Distinguishing Features
o/o	-	-	Includes two serial interfaces RS-232C or 20mA.
-	-	-	Utilizes Intel 8291, 8292, 8293 with DMA capability.
o/o	8/16	20	I/O driver compatible with Intel iRMX86 and iRMX88 Basic I/O subsystems.
o/o	8/16	16/20	+5V only.
o/o	8/16	16/20	Multimodule, +5V only, complete 488 talker/listener/controller implementation.
o/o	8/-	16/20/24	Full function GPIB Controller, Talker, Listener; 24-bit DMA addressing; 500Kbytes/sec max transfer rate; sample software routines, without memory boundaries.
o/o	8/-	8/16	Full function GPIB Controller, Talker, Listener; optional circuitry and connectors for 3 Intel type SBX piggyback boards for multi-function capability; sample software routines.
o/o	8/-	8/16	Full function GPIB Controller, Talker, Listener; sample software routines; Intel type SBX piggyback card.
o/o	8/16	16/20	Z80A based; All GPIB firmware included, expandable to 16 controllers.
o/o	-	-	Two serial ports; up to 64Kbytes of EPROM.
-/-	-	-	Uses T.I. TMS-9914 GPIB controller SBX MULTIMODULE.
o/o	8/16	20	Most inexpensive GPIB/MULTIBUS controllers available; same as ZT85/38 but without DMA. Complete with software drivers; 66 page manual, cable and application examples.
o/o	8/16	16	Least overhead of Ziotech's controllers; on-board processor relieves system CPU of all overhead during data transfers. Complete with software drivers, 85 page manual, cable and application examples.
o/o	8/16	20	Highest speed interface that has its own on-board DMA; no DMA support required from system CPU board. Complete with software drivers, 74 page manual, cable and application examples.

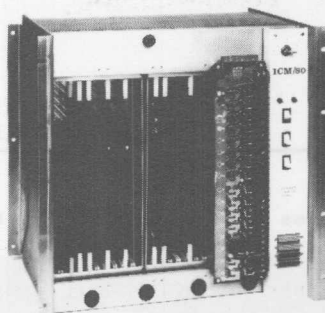


# DCS High Reliability Multibus Microcomputer Systems for Industry



## DCS/86L

16-bit (8086) Multibus microcomputer system with CDC Lark 16 megabyte cartridge disk. *Removable cartridge eliminates need for streaming tape backup.*



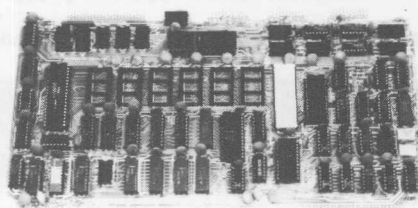
## ICM

The industrial control module is a rugged Multibus unit for NEMA or rack mounting. The ICM was designed for the factory floor. The unit contains a 9-slot cardcage, heavy duty power supply and front panel with real time clock.



## DCS/86

16-bit (8086) Multibus microcomputer system with dual floppy disks or 8" CDC Finch high performance Winchester disk unit. A 9-slot Multibus cardcage permits significant expansion.



## Components (OEM)

DCS designs and manufactures Multibus compatible CPUs (8 and 16-bit), floppy and hard disk controllers, IEEE 488, memory, Multibus cardcages, etc. DCS offers OEM application support by experienced system engineers.

## DCS

Distributed Computer Systems is a manufacturer of high reliability, rugged Multibus systems for industrial control, factory automation, data communications and software development.

## Reliability

The DCS/80, introduced in 1979, was the first low cost industrial quality Multibus system on the market and was praised by hundreds of customers for its rugged construction and reliability. All our electronics are "burned in" at 55°C in an environmental chamber and checked extensively at the system level. Our systems utilize error correcting ram which increases MTBF for the memory module to 10+ years. DCS offers the *best industrial microcomputer system value in the industry* and we welcome your comparison.

## DCS Growth Path to Performance

In 1979 we said that DCS systems would never become obsolete and in the 2nd quarter 1981, our first DCS/86 system which utilizes the 16-bit 8086 Intel Microprocessor was shipped. The quality/price/performance index of the DCS/86 is superior to most minicomputers. Any DCS/80 system in the field can be upgraded to run approximately 10 times as fast by replacing one (1) Multibus module! DCS as a leader in Multibus systems design has obligated itself to provide a viable hardware and software growth path for its customers.

## Software

Rugged, reliable, high performance hardware is only a part of the DCS systems philosophy. DCS offers the *largest selection of software available for 16-bit microcomputer systems and a staff to provide customer support.* The DCS/86 utilizes standard operating systems such as CPM/86, MPM/86 (multi-user, multi-tasking), Concurrent CPM/86 (single user, multi-tasking), MS-DOS (original operating system selected for IBM PC), Xenix (UNIX) and iRMX86 (Intel multi-tasking DOS). High level languages include Fortran, Basic, Pascal, PL/1 (subset G), PLMX, Cobol, "C" and ADA. *No other 16-bit microcomputer system can offer this level of software support.*

## Field Proven

Hundreds of DCS systems are in use throughout the United States and Western Europe in demanding control, data communication and industrial applications. Our staff has many years of system experience and we will gladly assist you in your system definition and design. Please be assured that DCS products are the finest available at any price.

CPM, MPM TM of Digital Research  
iRMX TM of Intel  
XENIX TM of Microsoft

## Distributed Computer Systems

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# More Multibus.™ And less.

**VMC 186 VIDEO MONITOR CONTROLLER** 80 Character X 24 line alphanumeric and limited graphic display. Upper and lower case. Reverse, half-intensity, flashing, and underline attributes.

**FDC 1680 FLOPPY DISK CONTROLLER WITH 16K RAM** 4 single density drives. Automatic DMA into the dual-ported on-board 16K RAM.

**SMD 2181 STORAGE MODULE CONTROLLER** Same as SMD 2180 except *damned* fast DMA 24 bit addressing, 11 bit Error Correction, software selectable sector size and interleave. Can transfer a full track in one disk revolution.

**WDC 2880 WINCHESTER DISK CONTROLLER** Up to 8 drives with ANSI X3T9.3 interface. Very high speed DMA, 20 bit address. Software selectable sector size and interleave factor. 11 bit Error Correction.

We're constantly at work creating new capabilities for Multibus.

**LAN 5180 LOCAL AREA NETWORK CONTROLLER** Up to 255 devices are supported on a coaxial cable. Data rates up to 2 Mb/Sec. SDLC/HDL protocol, 20 bit DMA, automatic transaction completion, mailboxes. First in a family of LAN products.

**HDC 1880 HARD DISK CONTROLLER** Up to 4 cartridge (5440 type) disk drives. High speed 20 bit DMA. Automatic Retry, ECC, switch selectable sector size and interleave.

**SMD 2180 STORAGE MODULE CONTROLLER** Up to 4 SMD compatible drives (including CDC LARK), 8-300 MBytes, bit rates to 20 Mb/s. High Speed 20 bit DMA, ECC, switch selectable sector size and interleave.

Now, the most talented Multibus specialists in the country bring you more Multibus options than ever before. And less.

More technology with less risk. More function

with less cost. And more support with less hassle.

When you're ready to expand your Multibus capabilities, talk to us. We're the specialists who give you more. And less.

Entire rigid disk controller family is software interchangeable. Automatic completion of simple multisector commands, automatic recovery from errors, bad track mapping, full sector buffering, extensive diagnostic reporting. Variable burst DMA in 8 or 16 bit systems. Software drivers and disk subsystems also available.



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corporation

We stay ahead of our competition so you can stay ahead of yours.  
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Mike: Some thoughts on the new ASC product

- ✓ We require hi-performance computer — 68000 @ 10MHz & no wait states
- ✓ Do it on the Multibus — it has the peripherals we need now — stick with the IEEE-796 standard
- ✓ ASC requires 256 Kbytes of fast RAM. System II will need 1 Mbyte later this year!
- ✓ RAM must be dual-ported for direct access from disk controller!!
- ✓ ASC needs 2 serial ports: 1 ASCII terminal & 1 Bityne line with full modem support. SDLC too?

Yes Can we get some CMOS RAM with external backup?

Yes ASC needs GPIB — Can we use iSBX Multimodules for I/O expansion?

Sam — the M68K10 meets these specs. SBE has production capacity and the price is right. OK? OK let's use it!

ADAPTIVE SC			
Model	Serial	Parallel	ASCII
ASC 10	1	1	1
ASC 20	1	1	1
ASC 30	1	1	1
ASC 40	1	1	1
ASC 50	1	1	1
ASC 60	1	1	1
ASC 70	1	1	1
ASC 80	1	1	1
ASC 90	1	1	1
ASC 100	1	1	1

## ModulasTen™ M68K10... Because you need the best multibus 68000 available.

The ModulasTen M68K10 has been specially designed to provide all of the features, capabilities and performance you want in your next Multibus system—economically.

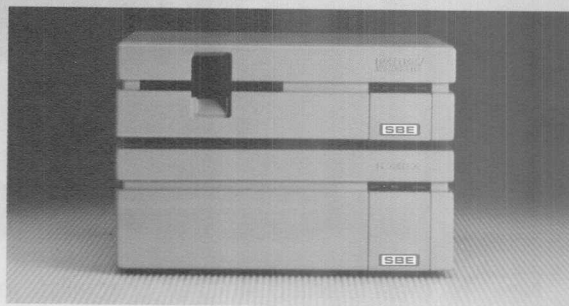
We've increased performance and reduced cost by using full 10 MHz operation without wait-states for on-board RAM.

In fact, there's up to 256 Kbytes of dynamic RAM that is dual-ported for data transfers to and from intelligent Multibus peripheral controllers and other M68K10s.

To simplify systems design, the M68K10 provides two multiprotocol serial ports, a 24-bit parallel port, triple counter and two iSBX Multimodule connectors. Now you can offer inexpensive I/O for process control, data analysis, lab and medical, ATE or other system applications.

In addition to all of its designed-in features, the M68K10 is already supported by some of the leading software systems available today...software including Regulus (UNIX-like) and CP/M-68K. And, it's designed to be compatible with future component developments like 256K-bit RAMs.

And, we'll soon be introducing a family of peripherals and support software.



For your development project, SBE offers a powerful Product Development Station.

If you're setting down tough design criteria for your next Multibus system, find out what SBE is doing to turn quality specs into reality.

Find out more about the M68K10. Call or write today. SBE, Inc., 4700 San Pablo Avenue, Emeryville, CA 94608, TWX 910-366-2116, (415) 652-1805.



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# Now — Get CMOS Reliability on the MULTIBUS™

With Diversified Technology's family of all-CMOS cards, you can design-in the advantages of CMOS and still enjoy the benefits of MULTIBUS architecture. Using the latest in CMOS technology, DTI's MULTIBUS cards give you the performance of LSTTL with power requirements measured in Milliwatts. You can even seal your computer in its enclosure with no fans or heat exchangers and make your system uninterrupted for days instead of minutes — at low cost.

## **8085 AND Z80 INSTRUCTION SET**

The heart of our line-up is the CMOS Board Computer: the CBC 800/216 series using the Z80- and 8085-compatible NSC800 microprocessor. It has 44 programmable I/O lines, 12 interrupts, serial I/O, 16K RAM, 32K ROM and more, all on one board, and its CMOS design draws only 25 ma @ 5V.

## **64K CMOS RAM — 6 YEAR RETENTION**

Need lots of non-volatile memory? You can get up to 64K bytes on one card, backed-up for 3000 hours with a rechargeable NiCad battery, or 6 years with a Lithium battery. Your 8- or 16-bit processor can access the RAM with bank selection or 20-bit addressing. Use this board in

any MULTIBUS system to replace core, disc or bubble and draw only 40 ma @ 5V.

## **ANALOG, DIGITAL, RAM/ROM EXPANSION**

Get low-noise CMOS 12-bit Analog I/O with programmable gain and/or offset in the 8730 series, and 64K of RAM/ROM, 22 I/O lines and two serial ports in the 8100 series.

## **USE YOUR INTEL MDS**

Have an Intel MDS? Plug in our compatible emulator for the NSC800 and get full development capability without buying a new development system, or use your

target system for development in either CP/M 2.2 or IOS-4, DTI's FORTH 79-Standard firmware.

## **A DECADE OF QUALITY CMOS PRODUCTS**

Our CMOS MULTIBUS family is backed by over ten years of design and manufacture of CMOS products for the industrial marketplace. We can help you solve your industrial/process problems with reliable CMOS products. Call or write Bill Long, CBC Product Manager for more information.



**Diversified Technology**

An Ergon Company

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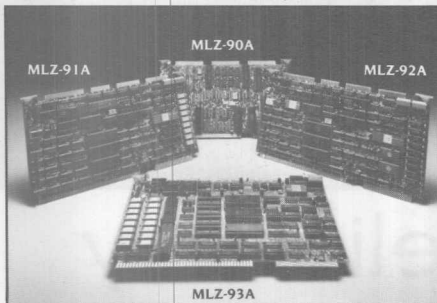
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JKS.

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NSC800 is a trademark of National Semiconductor Corp.  
CP/M is a trademark of Digital Research, Inc.  
MDS photo courtesy of Intel Corp.

# THERE IS MORE THAN ONE GOOD REASON TO CALL HEURIKON

**M**ake HEURIKON your source for Multibus microcomputers and system components.

Since 1972 Heurikon has been working hard to make life a little easier for those who "put it all together." Powerful Z-80™ and MC68000™ based Multibus™ microcomputers like MLZ-92A and HK68 have helped Heurikon customers find economical solutions for their problem applications.

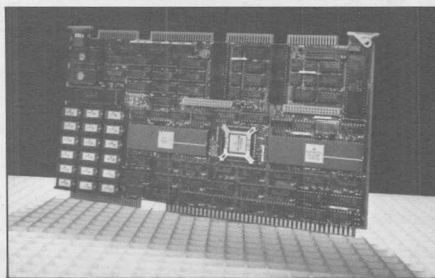


**MLZ-90A** single board microcomputer with nine byte-wide memory sockets for use with RAM or ROM (AM9511 and floppy disk drive controller optional).

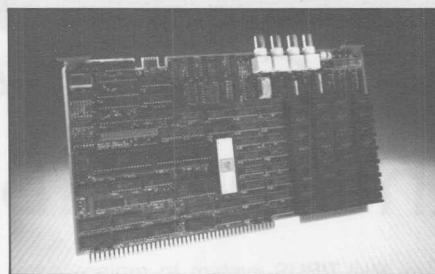
**MLZ-91A** single board CP/M™ system with on-card floppy disk drive controller, winchester interface, optional AM9511, streamer tape interface, two serial ports, one parallel port, 64K bytes RAM with parity, two EPROM sockets, and GPIB CONTROLLER.

**MLZ-92A** single board CP/M™ system with four serial ports on-card, floppy disk drive controller, winchester interface, optional AM9511, Centronics printer interface, 64K bytes of RAM with parity, and two EPROM sockets.

**MLZ-93A** single board CP/M™ system with 128K bytes of dual ported RAM, four EPROM sockets, floppy disk drive controller, optional AM9511 and powerful serial port features including SDLC and HDLC protocol support and modem controls.



**HK68™** powerful and versatile single board UNIX™ or CP/M-68K™ system with MC68000 CPU, MMU, quad channel DMA, four serial ports, 128K or 256K bytes of on-board RAM with parity (expandable to 1M byte on-board!), and two iSBX™ connectors for I/O expansion.



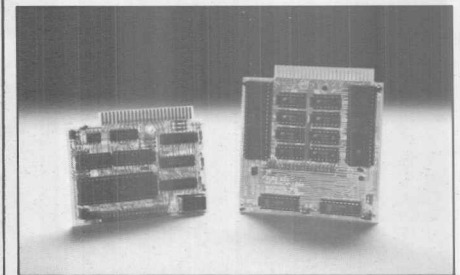
**MLZ-VDC** intelligent 640 x 480 x 4 color graphic controller based on the NEC 7220 controller chip with on-board Z-80 CPU, DMA controller, and user definable FIFO interface to Multibus™. Users may display up to 16 colors from a 4K palette.

## iSBX Expansion Models

Heurikon also stocks iSBX™ modules for I/O expansion on its HK68 and MLZ-VDC. These modules may be used on any other board

complying with the Intel iSBX specifications.

Presently available are the SBX-FDIO floppy disk controller module and the SBX-SIO serial port expansion module.



The SBX-FDIO can control up to four single or double sided, single or double density 5 1/4 inch or 8 inch floppy disk drives. A software toggles allows both 5 1/4 inch and 8 inch drives to be intermixed on the same cable!

The SBX-SIO is a quad serial port expansion module utilizing Zilog SCC controller chips with built in baud rate generators. The SBX-SIO is available in synchronous and asynchronous models.



## Systems

Heurikon also supplies completely integrated systems with your choice of CP/M-80™, MP/M-80™, CP/M-68K™, and "Berkeley enhanced" Unix operating systems.

Systems are available with four, six, and fourteen slot enclosures with 5 1/4 inch or 8 inch dual floppy or floppy winchester drive combinations.

# HEURIKON CORP.

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# The Multibus<sup>®</sup> Buyers Guide

## **Multibus<sup>™</sup> Market: Its Origin and Evolution**

The Multibus market is a relatively new phenomenon, but its roots can be traced back to the formative years of the microcomputer industry. Its history is one of humble beginnings and gradual, controlled evolution. An understanding of this history is useful in understanding the market.

In the early 1970's, the advent of VLSI component technology offered revolutionary benefits to the awaiting public. The emergence of these new "super chips" created opportunities and chaos in the marketplace, while competitive pressures forced companies to invest in the new concept. Everyone had to participate to be competitive, but not everyone had the design expertise.

Intel Corporation, being aware of the situation, introduced its Intellect<sup>™</sup> series of development systems to provide design engineers with the software development tools needed to implement system designs. This software assist was welcomed, however, customers also wanted to reduce the hardware design effort. Consequently, they purchased development system units, removed the boards for incorporation into their own boxes, and used the development system bus as the interface. They wanted the capability of designing their own custom boards, so a copy of the system bus specifications were requested. Intel then began distribution of the system bus specifications to the world.

Intel recognized the need for board level solution, and pursued it. In 1976, they introduced their first board-level computer, the iSBC<sup>™</sup> 80/10, integrating a CPU, memory and I/O on to the first OEM single board computer. Soon after, the development system bus was given its own name, the Multibus system bus, and the Multibus market was born.

The new single board computers became an instant success, and an array of compatible products emerged from Intel and other vendors as well. Then in 1977-78, the microcomputer industry witnessed the introduction of new VLSI microcomputers. These new 16-bit machines had a new demanding set of requirements. With a downward compatible evolution, the Multibus structure supported these new processors, and reaffirmed the viability of the Multibus system bus as a long-lined industry standard.

Some of the characteristics which are required of a standard should be known before examining its advantages. The three most important requirements are:

- A standard must have industry acceptance and support.
- A standard must evolve to meet the needs of the future.
- A standard must have a single point of control.

In the case of the Multibus system bus standard, it was introduced in 1976,

*(continued on page 116)*

iSBC, iSBX, Multibus, MultiChannel and Intellect are trademarks of Intel Corporation.

# The Multibus Buyers Guide

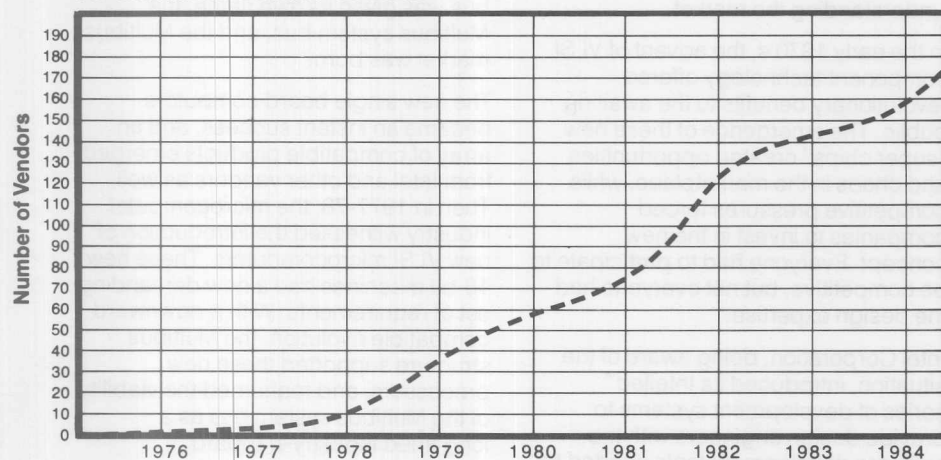
(continued from page 115)

and in two years had achieved wide spread industry acceptance. The bus had evolved to accommodate both 8 and 16-bit machines and their requirements. At first, Intel maintained control of the bus specifications, but now this task has been assumed by the IEEE. This single point of control

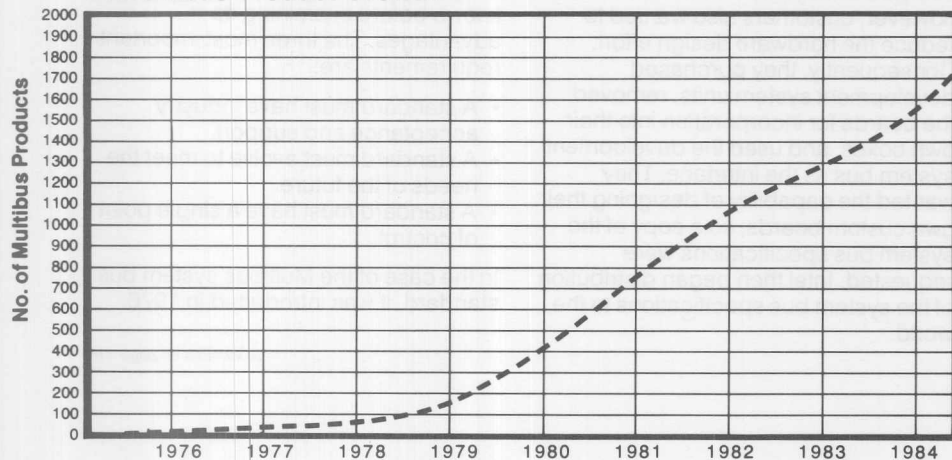
ensures product compatibility between different board sources. Multibus specifications were freely available to the industry and were in the public domain. It was for these reasons that Multibus architecture became the defacto industry standard, and also the IEEE bus standard, IEEE 796.

(continued on page 118)

## A. Multibus Vendor Growth



## B. Multibus Product Growth

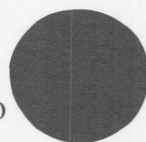
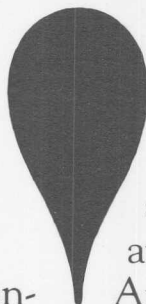


# WE LIKE IT THAT YOU LIKE IT

Nothing makes a company feel better than developing a popular product. But acceptance of the iRMX 86 Operating System has been nothing short of spectacular.

Today, it is the industry standard. Independent software vendors are using it to plug into VLSI technology, and to design in their own high performance features. And OEM's are using it to tap rapidly expanding mass market application software. In many popular languages.

They tell us it's because it has five times the multi-tasking talents of any other operating sys-



tem. And because it supports multi-processing, and is the only operating system taking full advantage of VLSI — already putting its advanced architectural virtues into silicon. And they're all raving about the cost advantages.

Frankly, we're flattered. So here's to you . . . the 868 vendors out there using our system.

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ATTN: OMO

Marketing Communications

# The Multibus<sup>®</sup> Buyers Guide

(continued from page 116)

The advantages that the Multibus architecture standard offers to the user are based on growing support by multiple sources and continued evolution. The Multibus market has shown phenomenal growth in the number of Multibus vendors. Another area of tremendous growth in the Multibus market is in the number of Multibus products made available to the industry by the growing Multibus vendor base. Together, the Multibus vendor and product growth trends reveal a healthy market.

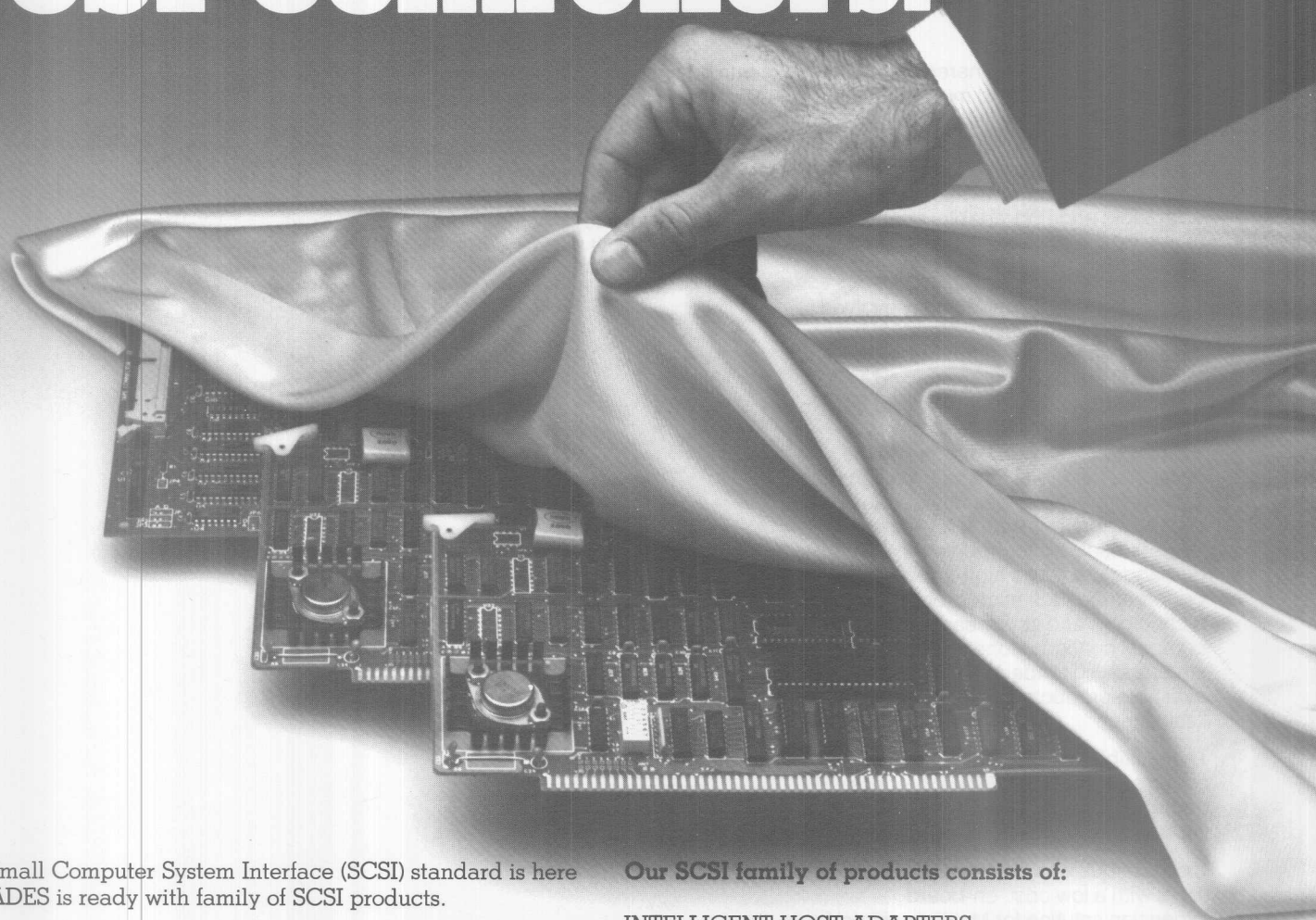
A healthy open market offers tremendous benefits to potential users of Multibus products. For instance, 120 Multibus vendors means competition, and competition encourages competitive, low prices. The user pays less per Multibus product and reduces overall system unit cost. Multiple sources of Multibus products also means reduced risk to the user by eliminating the threat of sole source supply of important parts. Also, an open market which offers over 1000 Multibus products provides a user with a wider range of choices. This selection of system solutions offers system designers almost unlimited flexibility and freedom. These pre-tested, off-the-shelf units mean a user can get to market quicker, with lower costs, and yet have the latest in VLSI technology. Additionally, a Multibus user can optimize his own resources and expertise, by concentrating on what he does best, and designing his own

proprietary boards to the Multibus *standard*. This allows the user to inject as much added-value into the system as he can in order to maximize his profit and be competitive. Only adherence to the Multibus standard allows this flexible, added value concept to work.

(continued on page 120)



# ADES Unveils the First Family of SCSI Controllers.



The Small Computer System Interface (SCSI) standard is here and ADES is ready with family of SCSI products.

The SCSI standards give you many competitive advantages:

#### **A single point connection for all types of peripherals**

This "commonality" enables you to lower the cost of your microcomputer systems. Because now you can shop among peripheral suppliers for price, warranty and maintenance incentives.

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- SMD disk
- 1/2" tape
- Local area network
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Call today (714) 594-5858, or send for our "Users Guide To SCSI Products." Write ADES, 2627 Pomona Blvd., Pomona, CA 91768, TWX 910 581 1211.

**ADES**

# The Multibus<sup>®</sup> Buyers Guide

(continued from page 118)

In order to maintain adherence to a standard, the standard must continue to evolve to meet the needs of the future. Since the Multibus markets needs are dynamic, the standard cannot remain static. It must be adaptable and upgradable; continuing to evolve in a controlled deliberate manner.

The Multibus standard actually evolved in two different ways: the structure and the architecture. The structure evolved from 8-bit to 16-bit capability, and direct addressing expanded from 64 KB to 16 MB. The architecture was expanded via the iSBX™ bus and the MultiChannel™ bus. These evolutionary expansions were necessary because a single system bus structure was no longer capable of supporting the demands of today's high-speed, high-performance VLSI microprocessor technology, and its increasingly complex configurations. A single bus structure also tended to limit the available products to one dimensional "solutions".

The Multibus architectural extensions occurred in the evolutionary process, because of the potential advantages in improved performance and flexibility.

The iSBX bus was created to provide users with a low cost, on-board expansion solution for Multibus single board computers. Currently, the iSBX boards allow users to add capability to a single board computer in the areas of parallel I/O, serial I/O, peripheral

controllers, and high-speed math; without going to the expense of adding another full Multibus board. The iSBX bus compatible boards enable users to buy exactly the capabilities they require for their Multibus based systems, which keeps both system size and system cost at a minimum.

(continued on page 122)

# SYSTEM-READY MULTIBUS™ COMMUNICATIONS FROM ETI MICRO

## SAVES TIME... SAVES MONEY

**W**e include sophisticated, user-proven, communication processing firmware as a standard feature on our multibus-compatible communication controllers, to cut your time to market and save precious dollars.

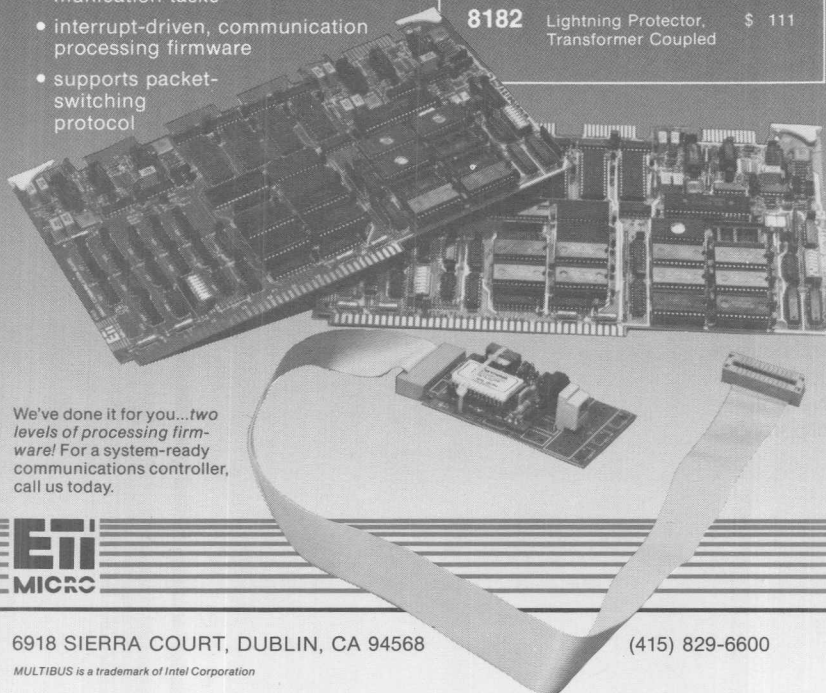
Our 8103 and 8140 controllers feature:

- two Bell modem ports and two RS232C ports
- controls up to 255 ETI Micro remotes
- communicates over twisted pair, leased phone lines or radio
- performs real-time multiple communication tasks
- interrupt-driven, communication processing firmware
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Combine our 8183 (FCC approved) Direct Access Arrangement with the 8140 and get rotary auto-dial and auto-answer.

		Quantity: 1
<b>8103</b>	Controller with two Bell 202 modems. Two RS232C ports	\$1,020
<b>8140</b>	Controller with two modems. (Bell 103/202, CCITT V.21, V.23) Two RS232C ports	\$1,240
<b>8183</b>	DAA Interface (FCC Part 68 Registered)	\$ 190
<b>8182</b>	Lightning Protector, Transformer Coupled	\$ 111



We've done it for you...two levels of processing firmware! For a system-ready communications controller, call us today.

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# The Multibus<sup>®</sup> Buyers Guide

(continued from page 120)

The MultiChannel bus was created to provide users with a separate path for DMA I/O block transfers. The ability of new VLSI microprocessors to process data at very high rates necessitates the connection of numerous high-speed I/O devices to the system bus. The major problem with this approach is that the attachment of these burst-type peripherals can saturate a general purpose bus and reduce the computing performance of the system. The MultiChannel bus was designed to eliminate this problem by providing for high speed (8 MB/sec) block transfers of data over an 8/16-bit wide data path between peripherals and single board computer resources.

Another evolutionary development of the Multibus standard is the continued development of support from all Multibus vendors. The hardware support is provided by primary, second source, and aftermarket suppliers offering a wide selection of products. Since the Multibus architecture is CPU independent, most of the industry's microcomputer components have been interfaced to the Multibus standard. This encourages the industry leaders to supply a continuous flow of VLSI technology to the Multibus board-level market. This broad base of silicon and board-level support, provides the user multiple levels of hardware integration for incorporation into his system.

Technical support has also developed over time, and now offers a wide variety of development/debug tools, documentation, and training for users of Multibus-based systems. These technical tools provide the means to design, debug, and implement microcomputer software and hardware systems with a minimum of effort.



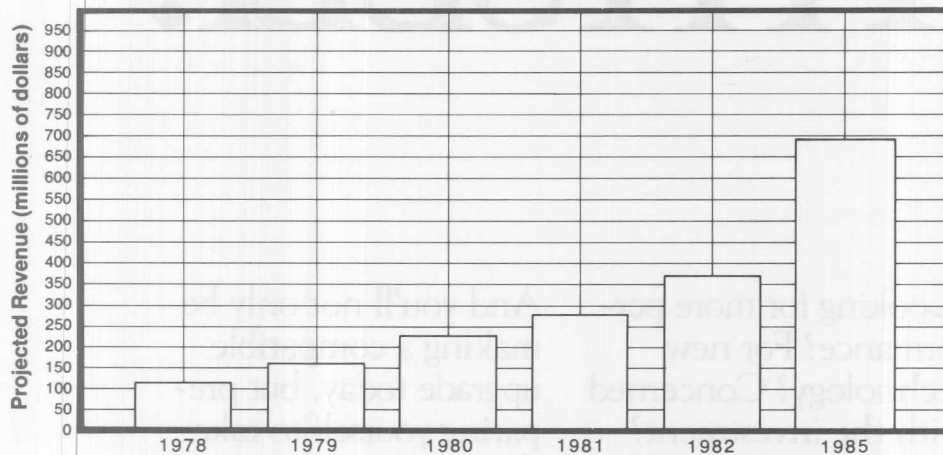
# The Multibus Buyers Guide

The continued evolution of the Multibus standard, along with continued support and adherence by the market has made the Multibus solution the fastest growing microcomputer system architecture in the board level marketplace. Its dominance of the 8-bit market and its growing influence in the 16-bit market is an example of its success as a true industry standard.

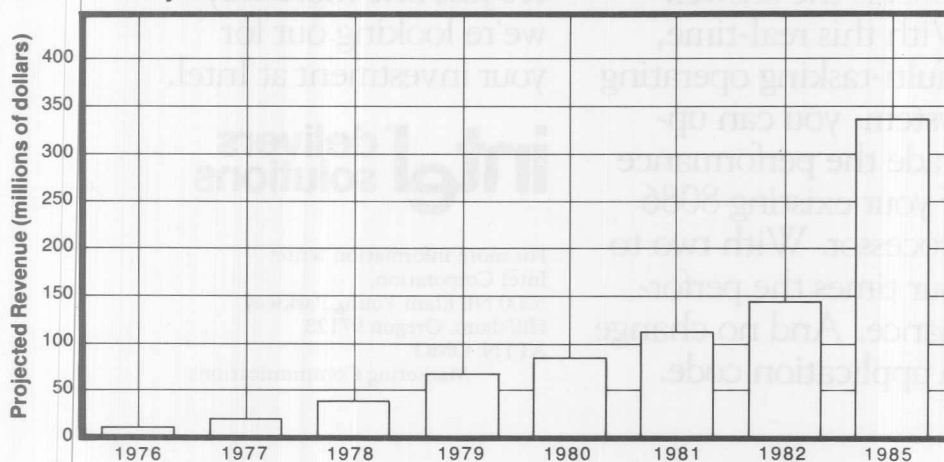
The future for the Multibus market looks promising, with the major overall market indicators projecting continued growth. For instance, a quick glance at bar charts C and D reveals that: 1) in 1985, Multibus-based products are projected to control 50% of the total available board market, and 2) over six other bus structures will be competing for the remaining 50%. The trend

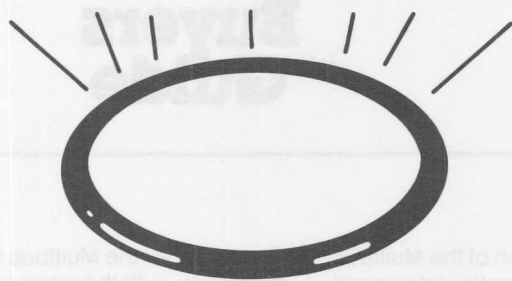
(continued on page 125)

## C. Available Market for Board Level Microcomputers



## D. Projected Growth of Multibus Product Revenue





# UPGRADE THYSELF.

Looking for more performance? For new technology? Concerned with the investment? Then the new iRMX 286R is the answer. With this real-time, multi-tasking operating system, you can upgrade the performance of your existing 8086 processor. With two to four times the performance. And no change in application code.

And you'll not only be making a compatible upgrade today, but preparing yourself to take the next step tomorrow. It's just one more way we're looking out for your investment at Intel.

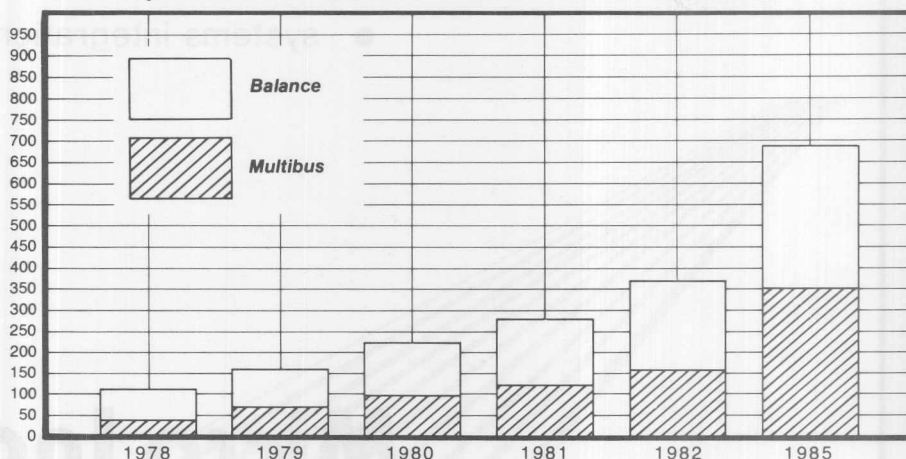
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# The Multibus<sup>®</sup> Buyers Guide

(continued from page 123)

## E. Comparison of Total Available Market/Multibus Share



seems to be clear, the Multibus market will continue to develop and become the predominant segment in the board-level market. This trend is supported by other evidence. For instance, the number of Multibus vendors has increased from approximately 10 to over 120 in just 5 years, with a projection of close to 200 vendors by 1985. (See Graph A, page 116.)

Another indicator which supports the continued Multibus market trend is the projection of Multibus product growth. For example, the curve on Graph B shows the growth of Multibus products

rising to a projected 2,000 available products by 1985. What all of this data is saying is that the Multibus market is growing rapidly, and this growth will continue to capture market share from industry competitors.

The user will continue to see significant growth in the Multibus vendor base and the products which they support. This data portrays the Multibus standard as a thriving, evolving, dynamic architecture supporting a market which is as "alive" today as it was in the past. The future seems bright for the Multibus market. It's come a long way in six years, and it will go a lot farther. ■

- custom multibus leader
- standard multibus products
- prototypes and volume manufacturing
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- systems integration

# Micro Industries



**Micro**

member steering committee multibus manufacturers' group

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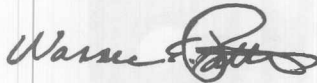
- \* ELECTRONIC AND MECHANICAL SYSTEMS DESIGN CAPABILITY
- \* EXTENSIVE MULTIBUS(R) EXPERIENCE
- \* STATE OF THE ART DEVELOPMENT EQUIPMENT
- \* CAD/CAM-COMplete DOCUMENTATION USING THE LATEST IN THREE-DIMENSIONAL EQUIPMENT
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- \* SYSTEMS INTEGRATION
- \* PROTOTYPE BUILD AND DEBUG
- \* END OF LIFE SUPPORT FOR DISCONTINUED PRODUCTS (1)
- \* COMPUTERIZED INVENTORY CONTROL, PRODUCT SCHEDULING AND VOLUME PROCUREMENT ORDERING
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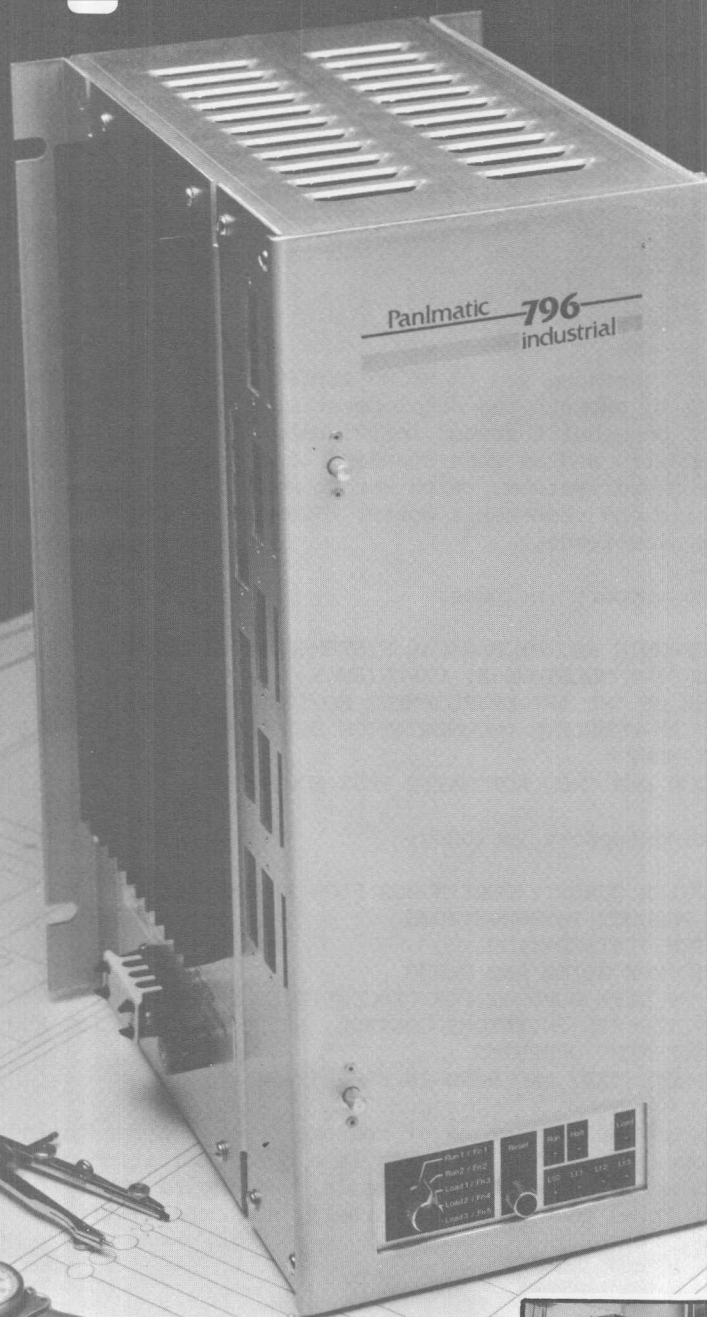
Sincerely,



Warren E. Potter  
Vice President

(1) We manufacture several discontinued iSBC (R) boards through agreement with INTEL CORPORATION.

Multibus and iSBC are registered trademarks of INTEL CORPORATION.



Introducing the Panlmatic 796 Industrial™, an affordable four slot Multibus chassis with features that used to cost extra:

- Modular 130 watt switching power supply on a removable chassis
- Adjustable power fail detection
- Front panel interface and controls through a field selectable I/O port
- Removable punched I/O panel with space for both D and ribbon connectors
- Accomodation for iSBX boards

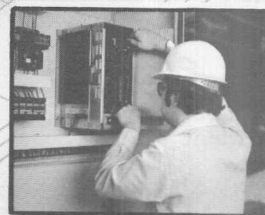
- Card access through a hinged, power interlocked front door
  - Rugged aluminum enclosure 11 1/2" deep for NEMA pan mounting
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## MICROBAR SYSTEMS INC.

March 3, 1983

Dear MULTIBUS USER:

The 796 bus is an official IEEE Standard, and as Chairman of the IEEE 796, I am, therefore, especially pleased to provide another update on the current status of the IEEE 796 standardization efforts. I am "especially pleased" because the 796 proposal has finally been passed as an official IEEE standard. This was done at the December 1982 meeting of the IEEE Standards Board. The standard now gets edited, typeset, and then printed by the IEEE Standards staff in New York. It will then be available for general availability directly from the IEEE Service Center, CP Dept., 445 Hoes Lane, Piscataway, NJ 08854. (When ordering the 796 Standard, be sure you do not get the October 1980 reprint from IEEE Computer magazine.)

The 796 Working Group is actively continuing its maintenance of the standard. Categories being considered include:

- 1) New errors or problems in the approved draft
- 2) Improvements to the approved draft.
- 3) Enhancements to the 796.

Enhancements to be considered (or rejected) include:

- a) Larger board sizes
- b) Eurocard formats
- c) High Speed P2 bus
- d) I/O definitions on P2
- e) Power fail signals
- f) Use of old -5V and -10V P1 pins
- g) Multimodules; Multichannel
- h) Multibus II

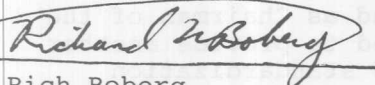
Active participation in the 796 Working Group (either in person or by correspondence) is encouraged for any Multibus user or vendor. Please contact me in order to be put on a mailing list in the appropriate category. Semi-annual status will be published in the Multibus Buyer's Guide with the permission of the publishers. Current status is available at any time upon request:

*continued*

Rich Boberg, Chairman IEEE 796  
Microbar Systems, Inc.  
1120 San Antonio Road  
Palo Alto, CA 94303  
(415) 964-2862

I would like to thank the hundreds of vendors and thousands of users who have supported the 796 bus and, therefore, the standards activity. I look forward to the continued future support and participation in the evolution of the 796 bus.

Sincerely,



Rich Boberg  
Chairman IEEE 796

RWB:emc



## Floppy Disk Controllers

---

Advanced Micro Devices  
Central Data Corporation  
Century Computer Corporation  
Comark Corporation  
Densan Co., Ltd.  
Distributed Computer Systems  
Diversified Technology, Inc.  
ETI Micro  
Intel Corporation  
Interphase Corporation  
Matrox Electronic Systems  
Megalogic Corporation  
Micromation, Inc.  
Micro/Sys, Inc.  
National Semiconductor Corp.  
NEC Electronics U.S.A.  
One/D Corp.  
Xebec  
Zendex Corporation

## Floppy Disk Controllers

Manufacturer	Model	Price	DFA	Deliv.	No. of Drives		Single		Dual		DMA	CRC
					8"	5 $\frac{1}{4}$ "	Side	Density	Side	Density		
AMD .....	Am95/6120	\$1095	5/80	stk	4	4	o	o	o	o	o	o
(408)988-7777												
	Am95/6110	\$945	1/80	stk	4	-	o	-	o	-	o	-
Central Data Corporation .	B1015	\$375	3/80	stk	4	-	o	-	o	o	o	o
(217)359-8010												
Century Computer .....	F-200	\$450	12/82	-	4	4	o	o	o	o	o	-
Comark Corporation .....	MF 85	\$695	7/81	-	4	3	o	o	o	o	o	-
(617)894-7000												
	MF 80	\$995	7/81	-	4	4	o	o	o	o	-	-
Densan .....	DSB 201	\$-	-	-	2	2	o	o	-	-	o	-
Distributed Computer .....	FD/80	\$600	-	-	o	o	o	o	o	o	-	-
(617)899-6619												
(800)225-4589												
Diversified Technology ...	CBC8204	\$850	★6/83	-	4	4	o	o	o	o	-	o
(601)856-4121												
ETI Micro .....	8160	\$1010	79	stk	4	-	-	o	-	o	o	-
(415)829-6600												
Intel Corporation .....	iSBC 202	\$1680	-	-	4	4	o	-	-	o	o	-
See Sales Office												
Listing	iSBC 208	\$1065	-	-	4	4	o	o	o	o	o	-
	iSBC 204	\$780	-	-	4	4	o	o	o	-	-	o
	iSBX 218	\$540	-	-	4	4	o	o	o	o	-	-

Multimaster	Recording Format	Data Bus (bits)	Address (bits)	Distinguishing Features
o	-	8-16	20	Provides dynamic, high speed DMA transfers of up to 1.8 Mbits/sec in block, burst, or byte modes. Has Am8085A CPU with 1Kbyte of RAM and FD1793 disk controller.
o	IBM 3740	8-16	20	Easy to use single density floppy disk controller.
o	MFM	8	24	
-	-	-	-	iSBX Module, up to 4 drives any combination.
-	IBM 3740	8	-	Am9511A math chip socket, CPM compatible.
-	Intel	8	-	SBC 201, SBC 202 compatible.
-	IBM 3740	-	-	
-	-	8	-	
-	IBM 3740 System 34	8	16	Low power; includes one RS-232C compatible serial port.
-	IBM 3740 IBM System 3	-	-	
-	-	8	8	Requires two card slots.
-	-	8	16	Up to 4 drives with up to 8 surfaces.
-	-	8	16	2 drives when double sided.
-	-	8	-	Multimodule, on-board data separator, phase locked loop.

continued next page

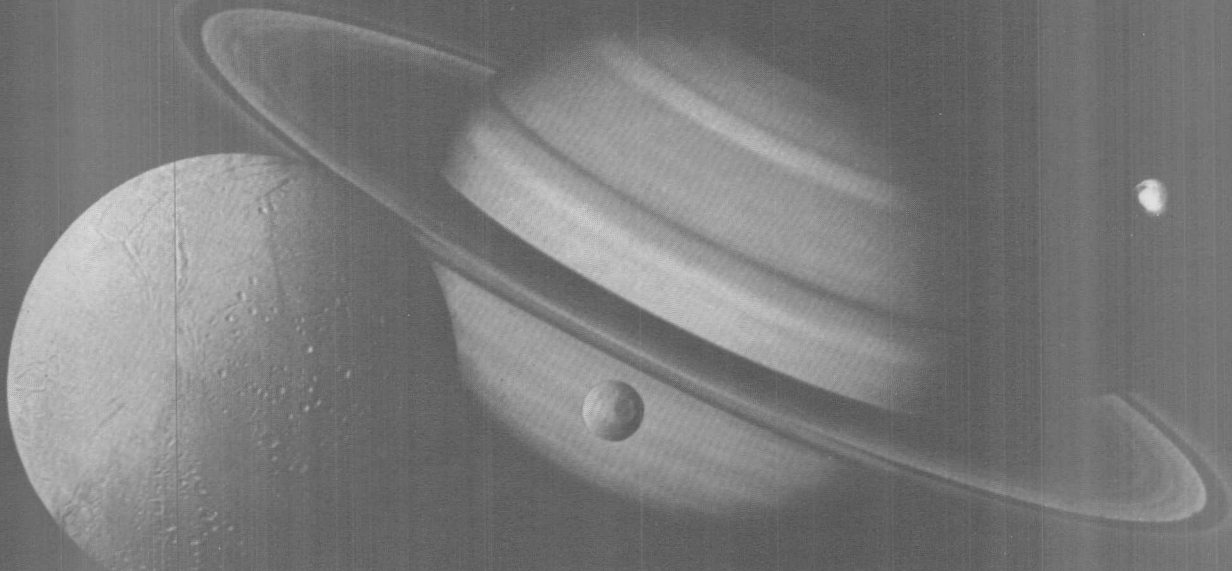
## Floppy Disk Controllers

Manufacturer	Model	Price	DFA	Deliv.	No. of Drives		Single		Dual		DMA	CRC
					8"	5¼"	Side	Density	Side	Density		
Interphase Corporation ... (214) 238-0971	SDC 2203	\$1795	-	-	4	-	o	o	-	o	o	o
Matrox Electronic ..... (514) 735-1182	FFD-1	\$625	-	-	4	4	-	-	-	o	o	-
	FFD-1/32	\$1360	-	-	4	4	o	o	o	o	o	-
Megalogic Corporation .... (513) 833-5222	MIS-1HS	\$895	-	-	-	4	o	o	o	o	-	o
Micromation ..... (415) 398-0289	MM-SBC-80F	\$1000	78	stk	4	4	o	o	o	o	o	o
Micro/Sys ..... (415) 398-0289	FD7650	\$720	1/81	30da	4	4	o	o	o	o	o	o
National Semiconductor ... See Sales Office Listing	BLC-8224	\$800	-	stk	4	4	o	o	o	o	o	o
	BLC-8222	\$800	-	stk	4	4	o	o	o	o	o	o
NEC Electronics ..... (617) 655-8833	BP2190	\$895	1/80	stk	4	3	-	o	o	o	o	-
One/D Corp. .... (408) 733-4200	FCF088	\$-	-	-	4	4	o	o	o	o	-	o
Xebec ..... (408) 733-4200	S1410	\$295	-	-	-	2	o	o	-	-	-	o
Zendex Corporation ..... (415) 828-3000	ZX-200A	\$1500	10/80	stk	4	-	o	o	-	o	o	o
	ZX-203	\$2795	★3/83	-	4	-	o	o	-	o	o	o
	ZX-205	\$506	5/80	stk	4	3	o	o	o	o	o	o
	ZX-208	\$980	9/81	stk	4	4	o	o	o	o	o	o
	ZX-218B	\$480	-	stk	4	4	o	o	o	o	-	o



Multimaster	Recording Format	Data Bus (bits)	Address (bits)	Distinguishing Features
o	ISSIS II	8	16	Emulates 201, 202 & 206 with SASI adapter; second source for Zendex ZX-203.
-	IBM 3740 IBM System 34	8-16	16	32Kbytes dual-port RAM.
-	IBM 3740 IBM System 34	8-16	16	
-	-	-	-	
-	Intel, IBM 3740 IBM System 3	8	8	Replaces iSBC 201 and 202.
o	IBM	8	16	
o	IBM 3740 IBM System 3	16	24	16Mbyte addressing range, compatible with slim line and mini-floppier.
o	IBM	8	16	
-	IBM	8	16-20	IBM compatible soft-sector recording format; single/double density; single/double sided; 8" or 5¼" drives; includes 48Kbytes of dual-ported RAM.
o	IBM 3740 IBM System 3	8-16	20	Embedded on-board file manager firmware supports CP/M file structure; dual-port RAM bus interface.
-	-	-	-	On-board data separator, Shugart SA 1400 host interface.
o	ISIS-II (MMFM)	8	20	Direct Shugart SA 801 interface. Replacement for Intel iSBC 201 and 202.
o	ISIS-II (MMFM)	8	20	Replaces iSBC 201, 202, 206. Same as ZX-200A but includes a SASI bus host adapter.
o	IBM (MFM)	8	16	Economical O.E.M. disk controller.
o	IBM (MFM)	8	24	Alternate to Intel iSBC 208.
iSBC	IBM (MFM)	8	16	Enhanced replacement for Intel SBX 218.

# EXPAND YOUR MULTIBUS SYSTEM'S OUTER LIMITS.



## XYLOGICS HAS SOLD MORE HIGH PERFORMANCE MULTIBUS PERIPHERAL CONTROLLERS TO MORE MAJOR OEMs THAN ANYONE.

That's a fact. But it's sometimes obscured by the breadth and popularity of Xylogics' full range of peripheral controllers for mini and micro computers.

Yet for Multibus™ systems employing 68000, 8086 or Z8000 class microprocessors with large capacity disk and tape drives, no other Multibus controllers offer better performance or more advanced features.

### **NEW 450 AND 472 CONTROLLERS JOIN POPULAR XYLOGICS 440.**

For the past three years, the Xylogics 440 peripheral controller—the industry's first Multibus SMD controller—has offered the highest peripheral control performance in Multibus benchmark tests and customer installations.

Now Xylogics has developed two new advances in Multibus periph-

eral control: the 450 and 472.

Together, they set the standard for price, performance and size for IEEE-796 Multibus applications.

The new Xylogics 450 peripheral controller provides even more performance for Multibus disk control applications. The 450 can address up to 16MB of memory and control up to four SMD disk drives at data rates of up to 1.8 MB/sec. non-interleaved.

The new Xylogics 472 is a high performance, single-board tape controller for streaming and start-stop tape drives. It can address up to 16MB of memory and control up to four tape drives—running at speeds from 12.5 ips to 125 ips and at densities of 800 bpi NRZI, 1600 bpi PE, 3200 bpi, or 6250 bpi GCR.

The 440, 450 and 472 feature advanced channel control tech-

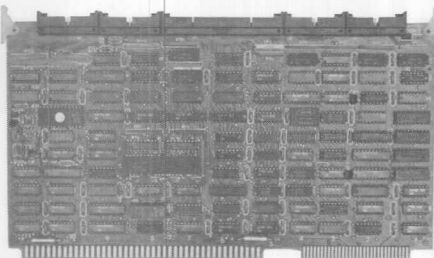
niques and are designed to work together for system optimization. For Multibus users, this means low bus usage, non-interleaved disk operation and true high-speed streaming with no repositioning. All three work with any 16, 20 or 24 bit address Multibus system.

Xylogics. The leader in high performance Multibus peripheral control.

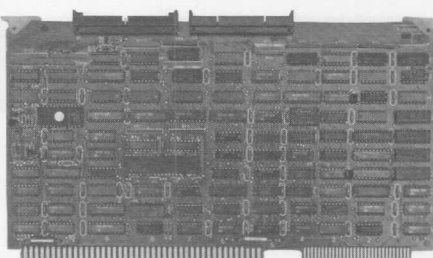
TM Multibus is a registered trademark of Intel Corp.



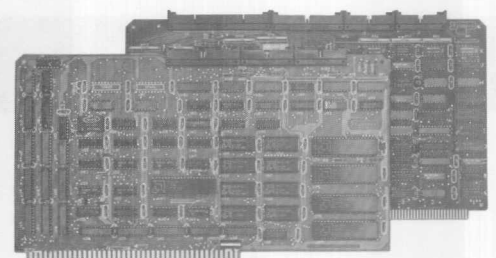
144 Middlesex Turnpike, Burlington, MA 01803  
Tel: (617) 272-8140 TWX: 710-332-0262  
Xylogics European Headquarters: (Slough, U.K.)  
Tel: (0753) 78921 Telex: (851) 847978  
Xylogics Germany (Eschborn)  
Tel: (49) 6196-47004



Xylogics 450 Multibus Disk Peripheral Controller.



Xylogics 472 Multibus Tape Peripheral Controller.



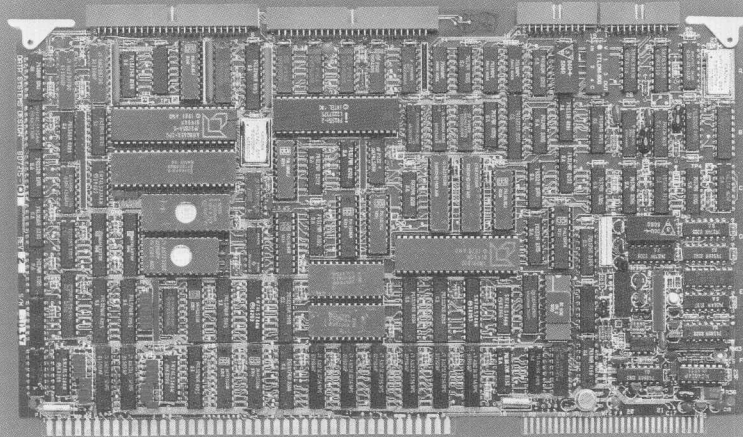
Xylogics 440 Multibus Disk Peripheral Controller.

## Other Peripheral Controllers

ADES  
Advant MicroSupport  
Alloy Engineering  
Central Data Corporation  
Comark Corporation  
Computer Products Corporation  
Data Systems Design  
Data Technology Corporation  
Distributed Computer Systems  
EMM/Sesco  
Ikon Corporation  
Intel Corporation  
Interphase Corporation  
Konan Corporation  
Megalogic Corporation  
Mesa Technology Corporation  
Metacomp, Inc.  
Micro Industries  
Microcomputer Systems  
Monolithic Systems Corp.  
National Semiconductor Corp.  
Scientific Micro Systems  
Shugart Associates  
Systech Corporation  
Xylogics



# ONE SLOT SHOPPING.



## INTRODUCING THE WINCHESTER/FLOPPY/TAPE THREE-IN-ONE MULTIBUS CONTROLLER.

### Try this on for size.

DSD's new 7215 single-board Multibus® controller/interface handles two SA1000-type 40Mb Winchester, a 1/4" streamer, and two 8" floppies.

Plus on-board data separation, 32-bit ECC, and self-diagnostics. All on the same board.

There's also a version for 5 1/4" drives, the 5215, with similar capabilities.

And both are very, very quick.

Thanks to a pipelined architecture that moves data at non-interleaved speeds.

### Top-of-the-line performance.

The 7215 and 5215 are the highest performance controllers on the market for 8" and 5 1/4" drives.

And that makes them ideal for multiuser and UNIX™ applications.

They also emulate Intel® iSBC® 215 and iSBX™ 218 controllers so you can run RMX 86 anytime.

And with 24-bit addressing support, you can take advantage of high performance microprocessors like the 68000 and the new inexpensive memory chips to address larger physical RAM memory.

To tune system performance, both boards offer four alternatives for bus arbitration. As well as having the capability to boost system performance by performing overlapped seeks and multisector operations.

### Plus the convenience to match.

The best part about all this performance is that it comes on one board. So it only takes up one back-plane slot. And there are no extra boards to fool with.

As easy as that sounds, there are those of you who'd rather not do-it-yourself. For you, the 7215 controller is also available in our 770 storage systems.

And like all DSD products, our Multibus boards and systems are supported by our exclusive Rapid Module Exchange™ and regional service centers.

### Shop around.

Compare our incomparable Multibus boards and systems to anything else you like. To make it easy, just send your business card to DSD Corporate Headquarters, Marketing Communications Department, for a free copy of "The Multibus Buyers Guide."

**Corporate Headquarters:** 2241 Lundy Avenue, San Jose, CA 95131. **Eastern Region Sales and Service:** Norwood, MA, (617) 769-7620. **Central Region Sales and Service:** Dallas, TX, (214) 980-4884. **Western Region Sales:** Santa Clara, CA, (408) 727-3163. **International Sales:** San Jose, CA, (408) 946-5800.

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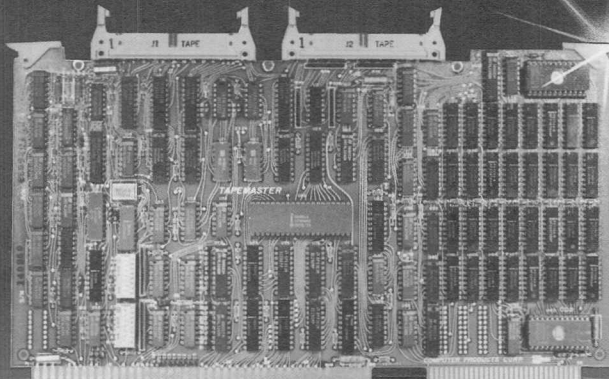
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## DATA SYSTEMS DESIGN



# SOME PRODUCTS

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Lead The Pack



## TAPEMASTER

Multibus\* 1/2-Inch Tape Adaptor  
Is One Of Them

- Controls up to 8 formatted drives in any combination of streaming or start/stop, NRZI, PE or dual-density.
- Executes over 30 commands including 3 different Read/Write modes.
- Multibus compatible, including 8/16 bit data bus, 24 bit addressing and DMA data transfer.
- Automatic Ring Buffering to simplify the interface to streaming drives.



**computer  
products corp.**

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Phone: (612) 559-2034

With field-proven installations, the CPC tapemaster is the most powerful Multibus adaptor for 1/2 inch magnetic tape drives available. Call or write today.

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## Other Peripheral Controllers

Manufacturer	Model	Price	DFA	Deliv.	Type
ADES ..... (714) 594-5858	GYPSY	\$1378	11/81	stk	Winchester Disk/Streaming Tape
	SCSI	-	★6/83	stk	Disks, Tapes, Printers, Network Host Adapters
Advant Corp. ....	MS 7300	\$-	★10/82	-	Winchester Cartridge Tape Controller
Alloy Engineering .....	DMB-1	\$850	-	-	Cartridge Tape (Data Electronics)
	TMB-1	\$1000	-	-	½" Tape Drive Controller
Central Data Corporation ..... (217) 359-8010	B1026	\$310	★10/82	stk	Winchester Cartridge Tape Controller
	B1023	\$530	7/82	30da	ANSI Winchester 5¼", 8", 14"
Comark Corporation ..... (617) 894-7000	MT 80	\$1295	1/79	-	½" Tape Drive
	MT 86	\$1295	12/81	-	½" Tape Drive
Computer Products Corporation ..... (612) 559-2034	TAPE-MASTER	\$1688	8/81	30da	All formatted ½-inch start/stop or streaming magnetic tape drives.
	Rimfire 38A	\$1895	80	30da	All PRIAM Winchester Disks and all formatted ½-inch magnetic tape drives.
	Rimfire 38AD	\$1603	80	30da	All PRIAM Winchester Disks.
	Rimfire 44	\$1795	4/82	30da	All ANSI-compatible disks and Archive/Cipher ½-inch tape drives.
	Rimfire 44D	\$1603	4/82	30da	All ANSI-compatible disks.
	Rimfire 44T	\$1103	6/82	30da	Archive/Cipher ½-inch cartridge tape drives.
	Rimfire 45	\$1895	2/82	30da	All ANSI-compatible disks and all formatted ½-inch magnetic tape drives.
	Rimfire 75	\$1745	9/82	30da	All ANSI-compatible disks and 3M HCD-75 ½-inch cartridge tape drives.
	Rimfire 75T	\$1130	9/82	30da	3M HCD-75 ½-inch cartridge tape drives.
	Pico-Mate	\$1313	10/81	30da	Kennedy 6450/6455 ½-inch start/stop and streaming cartridge tape drives.

# Other Proprietary Controllers

Drives Supported	Error Detection Correction	Data Bus (bits)	Address (bits)	Distinguishing Features
4/4	0	-	-	Requires host adapter board GHIA, FPI/O \$328. Interfaces the following disks - ST506, SA1000, Q2000, ANSI, PRIAM.
2/4	*	-	-	Requires SCSI Host Adapter. Full SCSI implementation.
8	ECC	8/16	24	DMA, serial/parallel intr. supports all leading 5¼-8" Winchesters (Priam, Shugart, St, Etc.); emulates SBC 201, 202, 206, 215 individually or simultaneously; single board.
4	-	-	-	Buffered 8086 based; requires 1 slot; 2K standard 8K max. buffer. Compatible with SBC 80/10, 80/20.
-	-	-	-	9-track formatted tape drive controller; Cipher F880 microstreamer.
8	CRC	8	24	Archive/Cipher streaming tape controller, IMI "C" Drive Winchester Controller.
8	CRC	8	24	DMA, 512 byte dual buffering; memory mapped.
8	-	8	-	
8	-	8	-	Full DMA capability, includes cables, specify drive type.
8	-	8/16	24	DMA, three read/write modes including auto Ring-buffers, over 30 commands, optional 2K-16K buffer.
4/4	CRC	8/16	24	DMA, programmable sector size defect mapping, dual function on single card.
4	CRC	8/16	24	DMA, programmable sector size defect mapping.
3/4	ECC	8/16	24	DMA, 32-bit ECC programmable sector size, defect mapping, on-board disk/tape data transfers, full set of separate tape commands.
8	ECC	8/16	24	DMA, 32-bit ECC, programmable sector size, defect mapping.
4	-	8/16	24	DMA, ring-buffer read/write commands for easy streaming control, 30 or 90 ips.
8/4	CRC	8/16	24	DMA, programmable sector size, defect mapping, dual function on single card.
8/4	ECC	8/16	24	DMA, 32-bit ECC, programmable sector size, defect mapping, on-board disk/tape transfers, full set of separate tape commands.
4	-	8/16	24	DMA, controls 30 ips or 60 ips tape drives, up to 67Mbytes per cartridge.
2	-	8/16	24	DMA, two read/write modes, ½" drive appears to user as familiar ½" drive.



## Other Peripheral Controllers

Manufacturer	Model	Price	DFA	Deliv.	Type
Data Systems Design ..... See Sales Office Listing	DSD-7215	\$1395	6/82	30da	8" Winchester, 8" Floppy Disk, 1/4" Streaming Tape.
	DSD-5215	\$1395	6/82	30da	5 1/4" Winchester, 5 1/4" Mini-Floppy, 1/4" Streaming Tape.
	DSD-6215	\$1495	★6/83	30-45da	5 1/4" Winchester, 8" Floppy Disk, 1/4" Streaming Tape.
	DSD-5217	\$1495	★6/83	30-45da	5 1/4" Winchester, 5 1/4" Floppy Disk, 1/4" Streaming Tape.
	DSD-6217	\$1495	★6/83	30-45da	5 1/4" Winchester, 8" Floppy Disk, 1/4" Streaming Tape.
	DSD-7217	\$1495	★6/83	30-45da	8" Winchester, 8" Floppy Disk, 1/4" Streaming Tape.
Data Technology Corporation .....	DTC-500	\$-	-	-	5 1/4" Winchester, 5 1/4" Floppy Disk.
	DTC-700	\$-	-	-	8" Winchester, 8" Floppy Disk, 1/4" Tape Drives.
Distributed Computer .....	DCS/WIN	\$2000	-	60da	CDC Finch 8" Winchester.
(800) 225-4589 (617) 899-6619	DCS Lark	\$2000	-	60da	CDC Lark Winchester Cartridge.
EMM/Sesco .....	SECS 80/ TCL	\$3250	-	-	1/2" Tape Drive.
Ikon Corporation .....	10071-5	\$2150	3/82	stk	Multibus-Versatec Plotter/Printer Interface.
(206) 624-3410					
Intel Corporation .....	iSBC 220	\$2500	-	-	SMD Disk Controller.
See Sales Office Listing					
	iSBC 215	\$1500	-	-	ANSI Winchester 5 1/4", 8", 14".
	iSBX 217B	\$495	★11/82	-	1/2" Cartridge Tape Controller.



Drives Supported	Error Detection Correction	Data Bus (bits)	Address (bits)	Distinguishing Features
5	ECC	8/16	24	<u>5215, 6215, 7215</u>
5	ECC	8/16	24	These three-function Multibus controllers feature high speed non-interleaved Winchester and floppy operation. They have 32-bit error correction, HyperDiagnostics, and on-board data separators. They also support 24-bit addressing, require no drive cable scrambler cards, AND provide back-up oriented QIC2 tape commands.
5	ECC	8/16	24	
5	ECC	8/16	24	<u>5217, 6217, 7217</u>
5	ECC	8/16	24	Same as 5215, 6215, 7215 except they provide QIC2 commands for file oriented tape transfers.
5	ECC	8/16	24	
4	P	8/16	24	Requires DTC Host Adapter, +5V only.
5	P	8/16	24	Requires DTC Host Adapter, +5V only.
4	ECC	-	-	Intel 8088 based, disk cache, Multimaster, ECC.
4	ECC	-	-	Intel 8088 based, disk cache, Multimaster, ECC.
4	CRC	-	-	MIL-Spec.
-	-	8/16	24	8/16/20/24-bit addressing; 8/16-bit data; single or block 400Kbyte/sec DMA; switchable byte ordering; bus and non-bus-vectorized interrupts; parallel or serial priority; TTL and Differential plotter I/O.
4	ECC	8/16	24	High speed SMD interface; 12 MB to 2.4 GB per controller, on-board diagnostic, ECC, and defective track handling. 8089 I/O processor for 2 DMA channels and controller intelligence.
4	ECC	8/16	24	The 8089 I/O processor provides DMA channels, plus user-programmable intelligence. Back-up provided via iSBX 218 or iSBX 217B modules. On-board diagnostics and ECC.
-	-	-	-	Byte-wide intelligent interface for 1/2" cartridge tape drives; interfaces to both start/stop and streamers from six vendors.

continued next page

## Other Peripheral Controllers

Manufacturer	Model	Price	DFA	Deliv.	Type
Interphase Corporation ..... (214) 238-0971	HDC 1880	\$1795	-	-	Cartridge Disk Controller
	SMD 2180	\$1995	-	-	SMD Disk Drive Controller
	SMD 2181	\$2250	-	-	SMD Disk Drive Controller
	WDC 2880	\$1895	-	-	ANSI Winchester Disk Controller
	SDC 2203	\$1795	-	-	SASI Disk/Floppy Disk
Konan Corporation ..... (602) 269-2649	TAISHO	\$895	7/82	stk	Hard Disk/Floppy Disk Controller
Megalogic Corporation ..... QIM-1/MX	QIM-1/MX	\$895	-	stk	Cartridge Tape Controller
	QIM-1/MN	\$295	-	stk	Cartridge Tape (mini-cartridge)
	TIM-1/MX	\$895	-	stk	Cartridge Tape Controller
Mesa Technology Corporation ..... (800) 638-2039	4100	\$3995	8/82	-	GCR Digital Tape Controller
Metacomp, Inc. .... (619) 571-1168	MPX 2000-310	\$295	★ 3/83	30da	Disk Controller
Micro Industries ..... (614) 895-0404	MIB501	\$677	-	stk	DMA Controller
Microcomputer Systems ..... MSC-9205	MSC-9205	\$795	-	stk	5¼" Winchester Disk Controller
Monolithic Systems ..... (303) 770-7400	MSC 8106	\$2100	-	-	Winchester Disk Controller
National Semiconductor ..... See Sales Office Listing	BLC-8225	\$-	-	-	Hard Disk/Winchester Disk Controller

Other Peripheral Controllers

Drives Supported	Error Detection Correction	Data Bus (bits)	Address (bits)	Distinguishing Features
4	ECC	-	20	+5V only; DMA.
4	ECC	8/16	20	Controls up to four 40-300Mbyte SMDs; DMA.
4	ECC	8/16	24	Transfers a full track in one disk revolution; DMA. +5V only.
8	ECC*	8/16	20	+5V only; ANSI 1226 compatibility.
-	CRC	8	20	Emulates Intel 201, 202 & 206 disk controllers; Appears as a 740 Disk System for ISSIS and CPM. Second source for Zendex ZX-203.
4/2	ECC	8/16	24	Controls up to four 5¼" hard disks and two floppies; incorporates error correction, automatic flaw mapping, DMA of commands and data; single board.
8	-	-	-	Quantex 650, ANSI/ECMA compatible.
1	-	-	-	Quantex 200.
4	-	-	-	Tandberg TDC 3000.
1	-	-	-	Single board MULTIBUS compatible interface. Direct connect to industry standard formatter. On-board FiFo minimizes bus latency. 16-bit addressing. 64Kbyte transfers. All DMA with adjustable throttle.
-	-	-	-	SASI Disk interface module for high-performance DMA to any SASI bus disks, including 5¼", 8", 14" Hard Disk and 5¼" or 8" floppy drives. Operates with METACOMP MPA-2000 (see Com. Ctlrs. pg. 95)
4	-	8/16	16	DMA Controller addressing up to 65,536 memory locations.
5	ECC	8/16	20	Supports 4 ST-506 and other drives; 512-bit buffer.
4	-	-	-	DTC SA 1403 Winchester Disk Controller; includes SA1000 controller and DTC 80.
8	ECC	16	24	Personality module supports various formats; 8" or 14" drives; 32-bit ECC and on-board multiprocessing for high throughput.

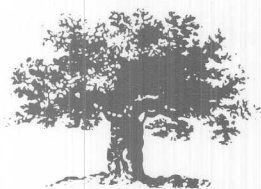
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## Other Peripheral Controllers

Manufacturer	Model	Price	DFA	Deliv.	Type
Scientific Micro Systems ..... (415)964-5700	FWD 8001	\$1500	10/81	30da	Floppy/Winchester Controller
	FWD 8006	\$1400	★12/82	30da	Floppy/Winchester Controller
Shugart Associates .....	SA 1586	\$-	-	-	Host Adapter for Fixed Disk Controllers
Systech Corporation .....	STC-4400	\$795	2/82	stk	DMA QIC-02 Cartridge Tape Controller
(619)695-3420	MLP-2000	\$650	7/82	stk	Dual Printer Controller
	VPC-1000	\$1550	★7/83	stk	Versatec Printer Controller
Xylogics .....	472	\$1795	★5/83	30da	½" Tape Drive
(617)272-8140	440	\$2295	2/80	30da	SMD Disk Drive
	450	\$2295	★4/83	30da	SMD Disk Drive



Drives Supported	Error Detection Correction	Data Bus (bits)	Address (bits)	Distinguishing Features
4	ECC	8/16	16/24	Single board; iSBC 215A compatible; supports two floppy drives and two Shugart or Quantum 8" Winchesters; on-board data separator; ECC 32-bit computer generated code.
4	ECC	8/16	16/20/24	Single board; iSBC 215A compatible, supports two 5¼" Winchesters and two 5¼" floppies or two 8" floppies. Direct transfer option; On-board data separator.
-	-	8/16	16/20/24	Single board PCB providing a complete interface with the SASI controller and the Multibus.
4	-	8/16	24	Supports all QIC-02 compatible Streaming Tape transports. As of the date of this publication, the following mfgs' endorse QIC-02 -Archive, Cipher, DEI, Irwin-Olivetti, Qantex, Rosscomp, & Tandberg.
2	-	8/16	24	Supports Centronics or Dataproducts compatible data communications or line printers in high-speed DMA environment. Has on-board self-test, automatic printer configuration and long lines option.
1	-	8/16	24	Supports Versatec printer plotters in high-speed DMA environment - has on-board self-test and long lines option.
4	-	8/16	16/20/24	One board, 800/1600/6250 bpi, 12.5 ips-125 ips, Pertec Interface, supports start-stop or streamers 2.5 MB/sec DMA speed.
4	ECC	8/16	16/20/24	Two board set, 512 byte FIFO buffer, 1.2Mbyte/sec. disk speed.
4	ECC	8/16	16/20/24	One board, 2048 byte FIFO buffer, 1.8 MB disk speed, automatic on-board ECC correction, status LEDs, implicit overlapped seek support, 2.5 MB/sec DMA speed.



**IRONOAK COMPANY**

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La Jolla, CA 92037  
(619) 450-0191

A graphic consisting of a stack of several books or documents, shown in perspective. From the top-left corner of the stack, a series of parallel lines radiate outwards across the page, creating a sense of depth and focus towards the title.

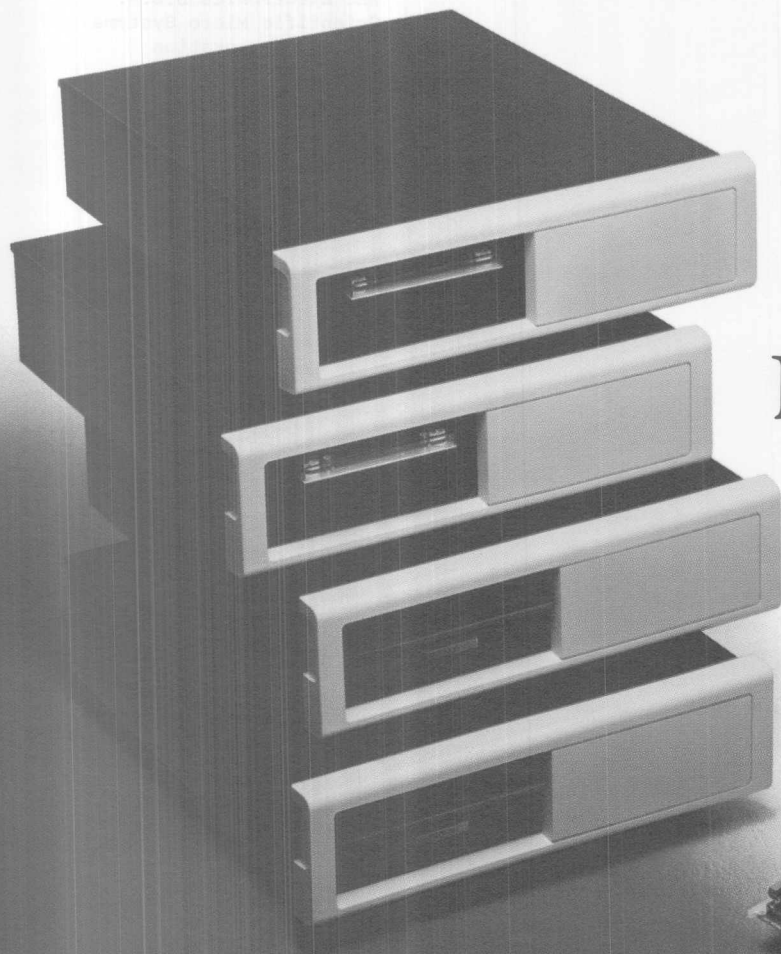
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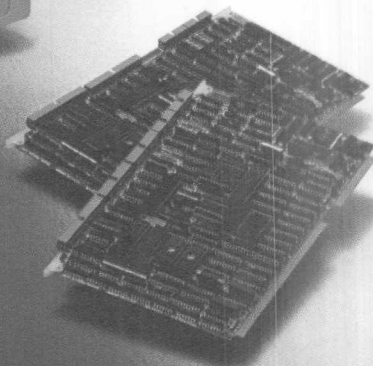
## Controller Peripheral Subsystems

ADES  
Advant MicroSupport  
Alloy Engineering  
Central Data Corporation  
Comark Corporation  
Computer Products Corporation  
Data Management Labs  
Data Systems Design  
Distributed Computer Systems  
Heurikon Corporation  
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Scientific Micro Systems  
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Zendex Corporation

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IMPORTANT FEATURE  
YOU CAN BUY.**



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The Multibus® market is very quietly growing like crazy.

The 16-bit processors are taking off. The applications are getting more complex. And the users are becoming more and more sophisticated.

If you're one of them, it's probably as clear to you as it is to us that you're going to need high performance disk systems designed to accommodate your future growth.

Rather than make you wait until the last minute, here they are.

### **Presenting the 770 Multibus Storage Systems from Data Systems Design.**

The DSD 770 Multibus storage systems offer you the kind of flexibility and performance you'll need, not only now, to get your product to market quickly, but also later, to keep pace with your growing needs.

The systems come in four basic configurations: An 8" 10 Mb or 40 Mb Winchester with either a ¼" streaming tape for back-up, or a 1 Mb floppy for low cost software distribution. All competitively priced.

And they all fit nicely into a 19" rack because each system is only 5¼" high.

But the real magic comes courtesy of our new multi-function Multibus controller/interface.

### **Multiple choice on one Multibus board.**

Our new controller/interface contains a Winchester disk interface that will handle two drives of up to 40 Mb each. An interface for ¼" streaming tape. And a floppy drive interface that can control two 1 Mb floppy drives.

Plus data separation.

32-bit ECC for high reliability.

Automatic self-test. Self diagnostics.

Full compatibility with IEEE 796 standards.

Intel® iSBC® 215 and iSBX™ 218 emulation.

24-bit addressing.

A high speed internal bus and pipelined architecture with a dual port buffer to move data at non-interleaved speeds. And a read/write sequencer to go with it that's capable of running faster than any 8" Winchester drive likely to come along for a long time.

But here's the kicker. All this takes up just one slot in your Multibus backplane because it all comes on just one board.

And for those of you with unique packaging requirements, our controller/interface board is also available by itself, for 8" or 5¼" disk drives.

### **Hindsight will prove you right.**

We don't expect you to buy systems with an eye to the future without looking into service and support.

But this is one area we were unable to improve upon. Because we decided we should offer the same kind of efficient service and intelligent support that's made us a leading storage system supplier in the DEC®-compatible market.

That kind of service includes our exclusive on-board HyperDiagnostics™. Remote diagnostic assistance. Rapid Module Exchange™. And the most comprehensive, yet inexpensive extended service program in the business: HyperService™, now with guaranteed twenty-four hour or less module swap.

All backed by support which, according to our customers, is second to none.

### **It pays to plan ahead.**

Given the opportunity all this presents, you're probably going to want to know more about the 770's. And the new Multibus controller/ interface that goes with them.

We can supply you with a comprehensive twelve-page data sheet, that tells you everything you need to know about both, and it's yours for the asking.

So call us today.

Better yet, call us yesterday.

The way things are going, it's already tomorrow.

Corporate Headquarters: 2241 Lundy Avenue, San Jose, CA 95131. Eastern Region Sales and Service: Norwood, MA, (617) 769-7620. Central Region Sales and Service: Dallas, TX, (214) 980-4884. Western Region Sales: Santa Clara, CA, (408) 727-3163. International Sales: San Jose, CA, (408) 946-5800.

## **DATA SYSTEMS DESIGN**

**INTERNATIONAL SALES:** Australia 03/544 3444; Belgium and Luxembourg 02/7209038; Canada 416/625 1907; Denmark 02/63 22 33; Finland 90/88 50 11; France 03/411 5454; Hong Kong and Peoples Republic of China 03/696231; Israel 52-52444; Italy 02/4047648; Japan, Osaka 06/323 1707; Tokyo 03/345 1411; Netherlands 02977-22456; New Zealand 04/693 008; Norway 02/78 94 60; Singapore, Malaysia, and Indonesia 2241077; Spain 01/433 2412; Sweden 08/38 03 70; Switzerland 01/741 41 11; United Kingdom 7073/34774; West Germany and Austria 089/1204-0; Yugoslavia 61/263 261

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## Controller Peripheral Subsystems

Manufacturer	Model	Price	DFA	Deliv.	Type	Capacity (Mbytes)	Controller
ADES ..... (714) 594-5858	System 14	-	-	-	14" Winchester/ Streaming Tape Subsystem	154/20	GYPSY host intfc.
	System 8	-	-	-	8" Winchester/ Streaming Tape Subsystem	70/20	GYPSY host intfc.
Advant Corp. .... (408) 947-8766	MS4100	\$-	9/82	30da	Winchester/Cartridge/Floppy	10/140	MS 7300
	MS4200	\$-	*12/82	-	Multi-User Disk Sybssystem	35/140	-
Alloy Engineering .....	DMB-1	\$2650	-	-	Cartridge Tape Subsystem	13.4	DMB-1
	TMB-1	\$4750	-	-	9-Track Tape Drive Subsystem	-	TMB-1
Central Data Corp. .... (217) 359-8010	D2000	\$2360	1/82	30da	Dual 8" Floppy	.34	Bl015
	D3002	\$4185	*11/82	30da	8" ANSI Winchester	20	Bl023
	D4002	\$9145	*12/82	30da	8" Winchester, 1/4" Streaming Tape	20/20	Bl026
Comark Corporation .....	MF80-S/DD	\$3395	7/81	-	Dual Floppy Disk Subsystem	.6/.6	MF 80
	MF85-D/DS	\$3495	7/81	-	Dual Floppy Disk Subsystem	1.2/1.2	MF 85
	MT 80-XXXX	\$-	1/79	-	1/2" Magnetic Tape Subsystem	-	MT 80
	MT 86-XXXX	\$-	12/81	-	1/2" Magnetic Tape Subsystem	-	MT 86
	MT 85-3M	\$2950	7/81	-	Cartridge Tape Subsystem	12	-
	MW 18	\$3995	4/82	-	5 1/4" Winchester Subsystem	18	MW 86

# Control Peripheral Subsystems

Drive	H"	W"	Enclosure D"	Rackmount	Table-Top	Distinguishing Features
-	9.75	17	23	-	o	CP/M, MP/M, CP/M86 Turbo Dos, others available.
-	9.75	17	23	-	o	CP/M, MP/M, CP/M86 Turbo Dos, others available.
Priam	10.5	16.25	23.0	o	o	Complete add-on mass storage module for Intel micro development systems; 100% hardware/software compatible with ISIS. Supports two storage devices in each encl.
Priam	10.5	16.25	23.0	o	o	Same as MS4100 except adds base band coax network to allow multiple users to share large disk space. UNIX-like access provides user and write protection.
DEI	5.25	19	-	o	-	
Cipher F880	-	-	-	o	*	Includes controller; tape drive; cables and software.
Tandon	10.5	16.75	22.75	*	o	2 or 4 drives, single or double sided.
3M	10.5	16.75	22.75	*	o	Capacities of up to 120M available.
IMI Disk Archive/	10.5	16.75	22.75	*	o	10-40M disk available, 20M tape.
Cipher Shugart 801R	5.21	17.4	22.63	*	o	Dual floppy 8" disks; p/s; fan/ Intel format.
QUME	5.21	17.4	22.63	*	o	Dual 8" floppys, IBM format, expandable to 4 drive system.
Digidata	-	-	-	o	-	Tape drives and formatters; 11 models.
Digidata	-	-	-	o	-	11 models, includes formatter, cables, software drivers.
3M	4.6	8.6	14.2	*	o	
Disktron	4.6	8.6	14.25	*	o	Expandable to 36Mbytes, chassis fits 8" form factor for easy integration.

continued next page

## Controller Peripheral Subsystems

Manufacturer	Model	Price	DFA	Deliv.	Type	Capacity (Mbytes)	Controller
Computer Products Corp. ... (512) 559-2034	TOP-80	\$-	*3/83	30da	½" Tape drive subsystem for CPM/CPM86 system	-	all ½"
	-	\$-	1/80	45da	Universal Disk or Tape Subsystems	10/160 16/80	Various
Data Management Labs .....	1010	\$6900	*12/82	-	Winchester/Floppy Subsystem	5.7	-
	1011	\$5900	6/82	-	8" Winchester Subsystem	3.6	-
	1040	\$9200	6/82	-	Winchester/Floppy Subsystem	26.2	-
	1041	\$8200	6/82	-	Winchester Subsystem	25.2	-
Data Systems Designs .....	DSD 770-T10	\$8375	6/82	30- 45da	Winchester/½" Streaming Tape Subsystem	10/20	DSD 7215
See Sales Office Listing	DSD 770-T40	\$10479	6/82	30- 45da	Winchester/½" Streaming Tape Subsystem	40/20	DSD 7215
	DSD 770-F10	\$6895	6/82	30- 45da	Winchester/Floppy Subsystem	10/1	DSD 7215
	DSD 770-F40	\$8995	6/82	30- 45da	Winchester/Floppy Subsystem	40/1	DSD 7215
	DSD 770-F80	\$-	*7/83	30- 45da	Winchester/½" Streaming Tape Subsystem	8/1	DSD 7215
Distributed Computer Sys. . (800) 225-4589 (617) 899-6619	DCS/MT	\$8000+	-	-	½" Magnetic Tape	-	-
	DCS Lark	\$8000	-	-	Winchester Cartridge	16	-



# Control Peripheral Subsystems

Drive	H"	W"	Enclosure D"	Rackmount	Table-Top	Distinguishing Features
-	-	-	-	-	-	Tape subsystem includes CPC Tapemaster, tape drive, cables and TOP/CPM86 Tape Utility.
Various	-	-	-	-	-	CPC subsystems are available as OEM pieces in varying capacities and configurations dependent on vendor preferred peripherals and controller.
-	7.0	17.5	24	-	-	On-line storage; compatible with Intellec 800 Series II and III; uses host interface adapter.
-	7.0	17.5	24	-	-	
-	7.0	17.5	24	-	-	
-	7.0	17.5	24	-	-	
SA1004	5.25	19	22	o	-	8" Winchester plus 1/4" streaming tape drive; includes DSD 7215 controller which will also control floppy drives. Can be daisy chained to additional drives.
Q2040	5.25	19	22	o	-	Same as above, except higher capacity.
SA1004 CDC9406	5.25	19	22	o	-	8" Winchester plus double-sided floppy drive. Additional drives can be daisy chained.
Quantum 40M CDC9406	5.25	19	22	o	-	8" Winchester plus double-sided floppy drive. Additional drives can be daisy chained.
Q80M CDC9406	5.25	19	22	-	-	8" Winchester plus 1/4" Streaming Tape. Additional drives can be daisy chained.
-	-	-	-	-	-	Fortran, Pascal, Basic software support for back-up; Intel MDS compatible.
-	5.25	19	21	o	*	SS, DD 8" floppy drive (DS, DD optional); includes controller; front panel; p/s; and all internal cables.

continued next page

## Controller Peripheral Subsystems

Manufacturer	Model	Price	DFA	Deliv.	Type	Capacity (Mbytes)	Controller
Heurikon Corporation ..... (608) 271-8700 (800) 356-9602	MLZ-FW-R101	\$4995	-	-	Winchester/Floppy Subsystem	10	-
	MLZ-FW-R202	\$5895	-	-	Winchester/Floppy Subsystem	20/-	-
	MLZ-FW-402	\$7045	-	-	Winchester/Floppy Subsystem	40/-	-
	MLZ-W01-R10	\$4195	-	-	Winchester Subsystem	10	-
	MLZ-W01-R20	\$4895	-	-	Winchester Subsystem	20	-
	MLZ-W01-R40	\$5995	-	-	Winchester Subsystem	40	-
	MLZ-W01-R80	\$10115	-	-	Dual Winchester Subsystem	80	-
	MLZ-ARC	\$2995	-	-	Streaming Tape Subsystem	20	-
	MLZ-AW-R20	\$6995	-	-	Winchester/Streaming Tape	20/20	-
	MLZ-AW-R40	\$7995	-	-	Winchester/Streaming Tape	40/20	-
Interphase Corporation ... (214) 238-0971	HDC1880WD-10	\$7995	-	-	Cartridge Disk Subsystem	10	HDC 1880
	WDS 200	\$7550	-	stk	Winchester Disk Subsystem	8	SMD 2180
	WDS 201	\$7850	-	stk	Winchester Disk Subsystem	24	SMD 2180
	WDS 230	\$6995	-	-	Winchester Disk Subsystem	16	SMD 2180
	WDS 210	\$6025	-	stk	Winchester Disk Subsystem	10	WDC 2880
	WDS 211	\$6450	-	stk	Winchester Disk Subsystem	20	WDC 2880
	WDS 212	\$9725	82	-	Winchester Disk Subsystem	60	WDC 2880

Controller-Peripheral Subsystems							
Drive	H"	W"	Enclosure D"	Rackmount	Table-Top	Distinguishing Features	
-	5.25	19	21	o	*	Same as R101 except 20M Winchester, (DS, DD only).	
-	5.25	19	21	o	*	Same as R101 except 40M Winchester, (DS, DD only).	
-	5.25	19	21	o	*	Winchester hard disk; includes controller; p/s front panel; all internal cables.	
-	5.25	19	21	o	*	Same as R10 except 20M Winchester.	
-	5.25	19	21	o	*	Same as R10 except 40M Winchester.	
-	5.25	19	21	o	*		
-	5.25	19	21	o	*		
-	-	-	-	o	*		
-	5.25	19	21	o	*		
-	5.25	19	21	o	*		
Western Dynex	7	19	21	o	*	Includes drive, cables, terminator block, controller.	
BASF	7	19	21	o	*	Includes SMD option.	
BASF	7	19	21	o	*	Includes SMD option.	
CDC	-	-	-	-	-	Includes SMD option.	
3M	7	19	21	o	*	Includes ANSI option.	
3M	7	19	21	o	*	Includes ANSI option.	
3M	7	19	21	o	*	Includes ANSI option.	

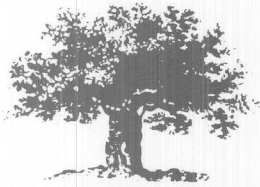
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## Controller-Peripheral Subsystems

Manufacturer	Model	Price	DFA	Deliv.	Type	Capacity (Mbytes)	Controller
Mesa Technology Corporation (800)638-2039	4001	\$10340	*3/83	-	Digital Tape System	-	4100
	4000	\$33950	8/82	-	GRC Digital Tape System	-	4100
	4002	\$6445	*3/83	-	½" Streaming Tape System	-	included
NEC Electronics U.S.A. .... (617)655-8833	SP0965	\$4495	3/82	30da	Dual Floppy Disk Subsystem	1.2/1.2	BP2190*
Scientific Micro Systems ..	FWT8022	\$3900	12/81	30da	Dual Floppy Disk Subsystem	.5/.5	FWD 8001
	FWT8027	\$4600	12/81	30da	Dual Floppy Disk Subsystem	1.2/1.2	FWD 8001
	FWT8017X	\$6800- 9500	12/81	30da	Winchester/Floppy Subsystem	1.2/to 37.7	FWD 8001
	FWT8017X	\$6800- 9500	12/81	30da	Winchester/Floppy Subsystem	1.2/to 37.7	FWD 8001
Systech Corporation ..... (619)695-3420	STC 4420	\$2950	2/82	stk	Cartridge Tape Subsystem	20	STC-4400
	STC 4440	\$2950	2/82	stk	Cartridge Tape Subsystem	40	STC-4400
	STC 4460	\$2950	*7/83	stk	Cartridge Tape Subsystem	60	STC-4400
U.S. Design Corporation ...	CSS-800	\$6245	*4/83	-	Winchester/½" Cartridge	17	8016
Zendex Corporation ..... (415)828-3000	ZX-705A	-	-	2wk	Dual Floppy Disk Subsystem	.6/.6	ZX-204
	ZX-708	\$3450	9/81	2wk	Dual Floppy Disk Subsystem	.5/.5	ZX-208
	ZX-710/720	\$3950	10/80	2wk	Dual Floppy Disk Subsystem	.5/.5	ZX-200A
	ZX-740-1	\$7550	*3/83	2wk	Winchester Driver	10	ZX-203
	ZX-740-2	\$9150	*3/83	2wk	Winchester Driver	20	ZX-203
	ZX-740-3	\$8995	*3/83	2wk	Winchester and Floppy	10/1	ZX-203
	ZX-740-3	\$8995	*3/83	2wk	Winchester and Floppy	10/1	ZX-203



Drive	H"	W"	Enclosure D"	Rackmount	Table-Top	Distinguishing Features
9-trk	-	-	-	o	-	Choice of 45 ips, 75 ips, and 125 ips Models. Fully ANSI/IBM compatible. iRMX-86 compatible software driver.
-	-	-	-	*	o	Includes Multibus compatible controller & cables.
-	-	-	-	*	o	Tridensity: GCR 6250, PE 1600, NRZI 800 BPI. 128 ips vacuum column transport. Interchangeable with ANSI/IBM Systems. iRMX-86 compatible driver.
-	-	-	-	*	o	Fully automatic loading of 1/2" ANSI standard 9-track tape. 25/100 ips operation at 1600 bpi data density.
NEC FD-1160	7.2	19.2	22.1	-	o	Buffered/direct data transfers, includes streaming tape.
Shugart SA800	5.25	19	21	*	*	Table-top, 2-8" disk drives, power supply, dual cooling fans, front panel indicators, mounting space for interface connectors.
Shugart SA850	5.25	19	21	*	*	
Quantum Shugart	5.25	19	21	*	*	Winchester/Floppy storage system using FWD8001 controllers; includes enclosure, power, one double-sided floppy drive and 8" Winchester with up to 75.6Mbyte storage.
QIC	5.5	9.5	20.5	*	o	1/4" streaming tape subsystem; includes enclosure, cabling, and power supply.
QIC	5.5	9.5	20.5	*	o	1/4" streaming tape subsystem; includes enclosure, cabling, and power supply.
QIC	5.5	9.5	20.5	*	o	1/4" streaming tape subsystem; includes enclosure and power supply.
-	5.5	17	22.5	*	o	
Shugart SA-801A	7.25	17.5	20.3	*	*	
Shugart SA-801A	7.25	17.5	20.3	*	*	Double (MFPM) and single density (FM) formats. 19" rack mountable.
Shugart SA-801A	7.25	17.5	20.3	*	*	Full compatibility with Intel iSBC 80 and MDS Multibus computers. Direct replacement for Intel MDS-710 and MDS-720.
-	7.25	17.5	20.3	*	*	Full compatibility with Intel MDS Multibus Development Systems.
-	7.25	17.5	20.3	*	*	Same as above with double the capacity.
-	7.25	17.5	20.3	*	*	Same as ZX-740-1 plus two half-height floppy disk drives in one enclosure.



**IRONOAK COMPANY**

3239 Caminito Ameca  
La Jolla, CA 92037  
(619) 450-0191

A graphic consisting of numerous parallel lines that originate from a single point on the left and fan out towards the right, creating a strong sense of perspective. At the bottom right, these lines terminate at a stylized representation of a computer keyboard, with individual keys visible.

# **The Multibus<sup>\*</sup> Buyers Guide**

\*Multibus™ is a trademark of Intel Corporation


# Voice Synthesis/Recognition

BECO  
Centigram Corp.  
General Digital Corp.  
Intel Corporation  
National Semiconductor Corp.  
Speech Plus, Inc

## Voice Synthesis/Recognition

Manufacturer	Model	Price	DFA	Deliv.	Type
BECO .....	PWB-103	\$275	-	-	Speech Output
Centigram Corp. .... (408)734-3222	LISA <sup>TM</sup>	\$2450	-	-	Speech Output Card
	TIM	\$650	-	-	Voice Synthesizer Module
General Digital .....	GDX-SPEECH	\$285	★10/82	stk	Voice Synthesis
(203)528-9041	TI				
Intel Corporation .....	iSBC570	\$4900	9/82	-	Speech Transaction Development Set
See Sales Office Listing					
	iSBC576	\$2900	9/82	-	Speech Transaction Board
	Speech Workshop	\$795	-	-	Intel Microcomputer Workshop
National Semiconductor .....	BLX-281	\$180	-	stk	Voice Synthesis
See Sales Office Listing					
Speech Plus, Inc. ....	SP 1000	\$1200	2/81	2wk	Voice Synthesis
(415)964-7023					
	SP 1100	\$1600	10/81	2wk	Voice Synthesis
	PR 2000	\$3500	4/82	-	Voice Synthesis





## Distinguishing Features

Provides 274 words of preprogrammed speech used in process control and quality control applications.

Compatible with Multibus compatible Voice Ware<sup>TM</sup> Development Systems developed by Centigram.

SBX-compatible, incorporates TI 5220 Speech Processor.

Complete speech synthesizer Expansion Module for natural sounding voice. Uses TI 5220 chip, LPC-10 techniques. Interchangeable on-board vocabulary ROM, filter, 2W amplifier, volume control.

Easy-to-use package for speech transaction evaluation, application design simulation and application development.

Provides Automatic Speech Recognition (ASR) function. Includes ROM-resident Speech Transaction Manager.

Introduction to speech communication with computers; Speech transaction development methodology; speech performance evaluation.

SBX MULTIMODULE, 144 word vocabulary.

Complete voice synthesizer capable of producing natural life-like speech quality; large vocabulary storage, up to 458Kbits; typically 200 to 300 seconds of speech.

Similar to Speech 1000 except encoded (LPC) human speech is downloadable into RAM; typically 30 seconds of speech.

Text to speech converter clearly enunciates English words or sentences by converting ASCII coded text into allophones then to highly intelligible speech.



**IRONOAK COMPANY**

3239 Caminito Armea  
La Jolla, CA 92037  
(619) 450-0191

A graphic consisting of a stack of several books, shown in perspective from the bottom right. From the top left corner of the stack, a series of parallel lines radiate outwards towards the top left of the page, creating a sense of depth and focus on the title.

# **The Multibus<sup>\*</sup> Buyers Guide**

\*Multibus™ is a trademark of Intel Corporation

# Industrial I/O

Astrosystems, Inc.  
 BECO  
 Burr-Brown  
 Compumotor Corporation  
 Controlsmith, Inc.  
 Delta Tau Data Systems, Inc.  
 Distributed Computer Systems  
 Megalogic Corporation  
 North Coast Automation, Inc.  
 Opto 22  
 Ormec Systems Corp.  
 Toko America, Inc.

## Industrial I/O

Note: See Parallel/Serial I/O for industrial grade parallel I/O.

Manufacturer	Model	Price	DFA	Deliv.	Type
Astrosystems Inc. .... (516) 328-1600	BMUT	\$995	-	-	Position Digitizer
BECO .....	PWB-100	\$375	-	-	Thumbwheel Switch Panel
	PWB-101	\$285	-	-	Pushbutton Panel
	PWB-102	\$295	-	-	Digital Display Panel
Burr-Brown .....	MP820-5	\$350	6/82	-	Pulse Accumulator, 5-channel
(602) 747-0711	MP821-5	\$400	6/82	-	Pulse Accumulator, Duration or Frequency
	MP801	\$335	-	-	Discrete Reed Relay Output
	MP810	\$410	-	-	Discrete Optically Isolated Input
Compumotor Corporation .....	1810	\$1095	*3/83	-	Motor Controller, Open Loop
(707) 778-1244 (800) 358-9068	1811	\$1450	*6/83	-	Motor Controller, Closed Loop
Controlsmith, Inc. ....	Smart Motion	\$4500+	-	60da	Motion Control
	PS-10	\$650	-	stk	Positioning Servo
	PS-20	\$795	-	stk	Positioning Servo
	PS-25	\$725	-	stk	Stepping Motor Interface



## Distinguishing Features

Astrosystems' series BMUT Absolute Encoders measure a shaft position and provide a binary output equivalent to shaft angle. The rugged transducer is mechanically coupled by the user to machinery and instruments of all types to allow the computer to continuously monitor the physical movements of one or more axes of motion. Up to 16 switches per panel.

8 lighted pushbuttons.

One six-digit, two five-digit displays.

5 channel; optically isolated; for pulse counting (accumulation) and pulse width (period) measurement; debounce circuit; 4 to 48 VDC @ 1.5 mA; 64K counts 16-bit; optional 15-channel version.

5 channel, 16 bits, 1500 VDC isolation, 4-48 VDC closure detection; single +5V supply; 10 KHz bandwidth; optional 15-channel version.

16 isolated relay outputs (optional 32 outputs); 0.5 A at 28 VDC.

24 channel dry contact closure; optional DC voltage level, 17 to 84 VDC; low DC voltage level, 1 to 5 VDC; AC voltage level 65 to 250 VAC.

Driver standard stepping motor translators and Compumotor's high precision microstepped motor/drives. On-board 5 MHz 8088 processor. 75 commands and may be I/O or memory mapped.

Incorporates 1810 command set, defines the target system's encoder and motor resolution over the Multibus.

Provides up to 8 axes of continuous-path motion control entirely via a full duplex EIA. Standard RS-232C communications port.

Positioning servo interface to any velocity-servo-driven positioning axis with incremental encoder feedback.

Two-axis, closed-loop-servo interface. Note: Controlsmith offers 20% to 40% discount to O.E.M. customers.

Two-axis stepping motor interface.

continued next page

## Industrial I/O

Note: See Parallel Serial I/O Expansion for industrial grade parallel I/O.

Manufacturer	Model	Price	DFA	Deliv.	Type
Delta Tau Data Systems Inc. ....	MC <sup>2</sup>	\$1100	★9/83	stk	Servo Position, Closed Loop
	MC <sup>2</sup> EX	\$395	★1/83	stk	Multimodule Axis Expander
Distributed Computer ..... (617)899-6619 (800)225-4589	DIGSYN-1	\$1500	-	-	Digital to Synchro
	SYNDIG-1	\$1200	-	-	Synchro to Digital
	DCS/PS/80	\$1200	-	-	Positioning Servo
	DCS/STEP2	\$1200	-	-	Stepping Motor Interface
Megalogic .....	SUE-I/O	\$345	-	2wk	Relay, I/O Port Module
North Coast Automation ..... (216)729-2200	9702	\$775	81	stk	Dual Industrial Motor Control
Opto 22 .....	Various	\$-	-	-	Optically Isolated Power Switching
Ormec Systems Corp. .... (716)385-3520	PRG-900	\$1345	4/82	2-5wk	Programmable Reference Generator
Toko America, Inc. .... (312)677-3640	NCB102-1	\$2660	-	stk	Two-Axis Control Module
	NCB102-2	\$3150	-	stk	Multi-Axis Control Module
	NCB102-3	\$1550	-	stk	Axis Expansion Module

### Distinguishing Features

N.C. & Robotics Control Board, expands to 16 axis. Controls DC servo amp/motor or stepper motor, encoder feedback. Operates stand alone or as slave to master CPU.

Two axis expansion iSBX Multimodule for MC<sup>2</sup>.

3-3 line digital to synchro outputs; 12-bit resolution.

3-3 line synchro inputs.

Interfaces to velocity servo driven positioning axis with incremental encoder feedback.

2 independent stepper motor interfaces with opto-isolation.

Up to 8 optically isolated relays; each relay fused at 5A, up to 240 V.

Compatible with 8 or 16-bit; can be used to control or measure position, velocity or tension; encoder 16-bit counter; single ended or differential inputs; two axes per board. Optional 12-bit DAC; 16-bit DAC; on-board +15V.

Switch (up to 1024 channels) 120/240 VAC or 60 VDC at 3 amps; optional switching to 200 VDC at 1 amp. Compatible with Multibus parallel I/O.

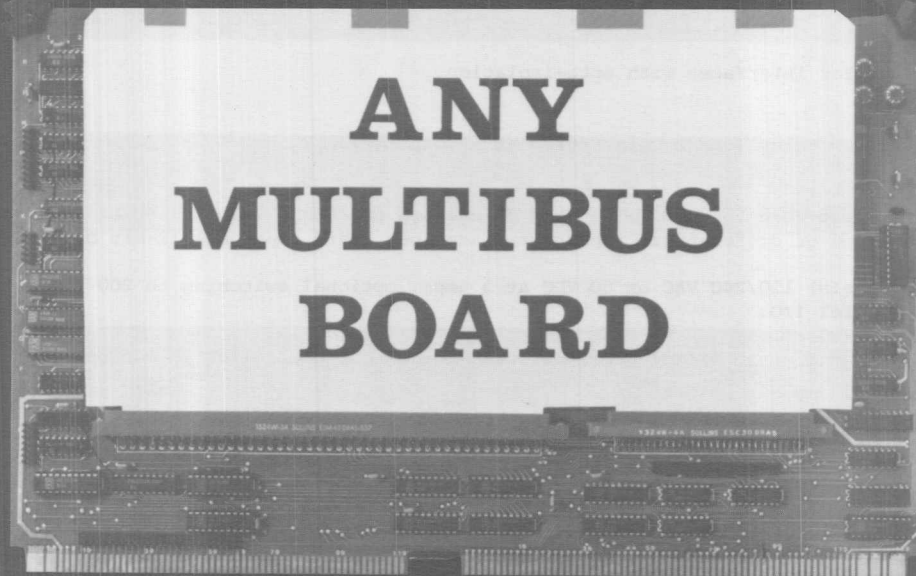
Through a differential parallel interface-commands Ormec Motor Loop Controller to control velocity and/or position.

The Numerical Control and Robotics Control Board, the NCB102, produces the interpolation signal to drive the DC servomotor or the stepping motor, and monitors the servo motor by receiving the error pulse.

Expansion up to four axes is capable by combining with the axis expansion module.

Used together with multi-axes control module.

# Now you can interface any Multibus<sup>TM</sup> board to Versabus<sup>TM</sup>



*Supports Versabus 24 bit addressing • Master, Slave, Master/Slave operation  
Designed for minimum installation labor • Conforms to Versabus spec. M68KVBS (D4)  
and Intel Multibus spec. Rev.-03, 4/81 • 5 levels of Versabus priority,  
with 2 modes • 7 levels of Versabus/Multibus vector interrupt*

## ***Applications:***

*Video Controllers • Analog I/O • Serial Expansion  
Parallel I/O • IEEE 488 (GPIB) • Comm. Controllers • 512kb ECC Ram  
Peripheral Controllers • DMA • CPU*

Multibus<sup>TM</sup> Intel Corp.  
Versabus<sup>TM</sup> Motorola Corp.



**HAL-VERSA  
ENGINEERING, INC.**  
18597 Paseo Tierra  
Saratoga, CA 95070  
(408) 374-2953



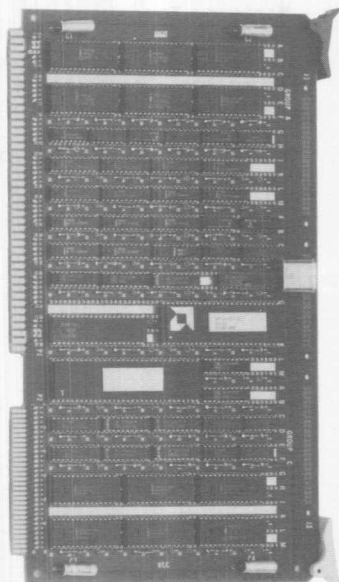
## Other Functions

Advanced Micro Devices  
 AIM Technology  
 Bit-3 Computer Corporation  
 Digital Pathways, Inc.  
 Distributed Computer Systems  
 DSP Systems Corporation  
 EG&G Reticon  
 ETI Micro  
 Hal-Versa Engineering, Inc.  
 Ikon Corporation  
 Intel Corporation  
 LeCroy Research Systems Corp.  
 Linear Systems, Ltd.  
 Marinco, Inc.  
 Medinova Corporation  
 Micomp Development Corporation  
 Micro/Sys, Inc.  
 Monolithic Systems Corp.  
 Morrow Computer  
 National Semiconductor Corp.  
 Procise Corporation  
 Proteon Associates, Inc.  
 Sky Computers  
 TITN, Inc.  
 Zendex Corporation



11785 Sonoma Valley Rd.  
 San Diego, CA 92121  
 (619) 453-5202 Telex 62-1901

# The Single Board Array Processor, With Dual Ports, That Crunches Numbers and Crumbles Cost.



The new APB 3000 array processor plugs directly into your Multibus\* or VME host processor, giving you wide applications and ultimate number crunching speed. There's no I/O required. Yet it takes but a single slot. And the price has broken the lower boundaries.

**Dual Port**—your host processor has full access to both program and data memory.

**Single Board**—frees at least one of your valuable board slots for other uses.

**Fast**—uses the 29116; the world's fastest micro-processor—10 million adds and multiplies per second—1024 point FFT in 2.4 milliseconds, 1024 vector multiplies and adds in 105 micro seconds.

**Memory Mapped**—8K by 48 bit program memory and 48K byte data memory, both mapped and requiring no I/O.

**Standard Routines**—FFT's, power spectral density, correlation, digital filtering, and deconvolution, on board in ROM.

**Versatile**—uses virtually any known algorithm, or design your own software. (Custom software design available.)

**Application**—real time analysis where it's needed—on site, signal processing, pattern recognition, data/voice encryption, surveillance and personnel identity/detection, Computer Aided Design, and other applications requiring rapid processing of large numerical arrays.

Contact our Applications Engineering Department for fast answers about the single solution that crunches numbers while crumbling cost.

**MARINCO, INC.**   
A HELIONETICS COMPANY

11760 Sorrento Valley Rd.  
San Diego, CA 92121

(619) 453-5203 Telex: 69-7901

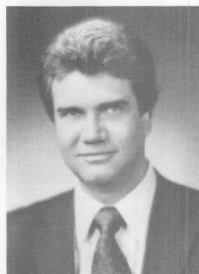
\*A Trademark of Intel Corporation

# PCM

## Your Key To Becoming A More Successful Manager

Your ability to effectively manage the widest range of personalities can determine your ultimate success in business. And now there exists a proven, quantifiable training process whereby you can learn how to reach and motivate any individual most effectively.

It is based on a dramatically new concept which earned Dr. Taibi Kahler, the founder of Process Communication Module, the Eric Berne Memorial Scientific Award in 1977.



Taibi Kahler, Ph.D.  
President, Taibi Kahler  
and Associates



Hedges Capers, Sr., Ph.D.  
Founder, San Diego Institute

It is a concept that has been developed into one of the fastest growing manager training programs in the U.S. and is being used by consulting groups in 8 other countries, including Canada, the U.K., Mexico and Japan.

## How It Works

Process Communication Module (PCM) is a three, four, or five day program that is preceded by a validated, reliable computer analysis of your own unique mix of PCM's six basic personality styles: The Workaholic, The Reactor, The Persister, The Rebel, The Dreamer and The Promoter.

Working from a real world-oriented model that used both new and classic management principles and concepts, the training begins by focusing on the impact of **how** you say **what** you say. It then goes on to identify and assess the strengths and weaknesses of the six basic personality styles, offers you proven ways to **reinforce** productive behavior patterns, **measures** your communications skills, **correlates** your management style to your strongest personality components, **predicts** your potential managerial success and failure patterns, **provides** you with intervention points for negative patterns, and **verifies** your productivity change through follow-up sessions. Visual aids, examples, practice sessions, work group and demonstrations increase your mastery.

## The Results

The insights and management tools you learn to use during your training program can be **applied immediately** to any level of management, wherever people communicate. The learning process is immediate and alive.

Planning, controlling, organizing and supervising — basic management functions — lend themselves to scientific scrutiny and invite a holistic approach to management growth. Classical management philosophy, blended with knowledge of personality structure, encourages satisfaction and personal growth on the job.

For employers, this means **higher** productivity, **lower** absenteeism, **better** morale and **increased** return on the human resource dollar.

For further information, or to arrange for a demonstration, write or call Barbara Cargill, San Diego Institute, 6639 La Jolla Blvd., La Jolla, CA 92037, 459-4368 or 459-4369.



San Diego  
Institute

## Other Functions

Manufacturer	Model	Price	DFA	Deliv.	Type
AMD ..... (408) 988-7777	94/2000	\$-	*	-	SBX Motherboard
AIM Technology ..... (408) 727-3711	BAB	\$1995	*11/82	30da	Multibus Signal Analyzer
Bit 3 Computer Corporation .....	303	\$735	*11/82	-	IBM PC to Multibus Interface
Digital Pathways, Inc. ....	TCU-410	\$360	-	-	Timing Control Unit
Distributed Computer ..... (617) 899-6619 (800) 225-4589	DCS/PROM	\$650	-	-	EPROM Programmer
DSP Systems Corporation ..... (714) 630-1330	DSP-FFT-1	\$3500	6/82	stk	Array Processor
	DSP-AP-4	\$3800	*3/83	-	Array Processor
EG&G Reticon .....	RSB6020	\$895	-	-	Image Sensing Interface
ETI Micro ..... (415) 829-6600	8150	\$660	3/82	stk	EPROM Programmer
Hal-Versa Engineering ..... (408) 374-2953	Synergist	\$579	1/82	stk	Multibus-VERSABUS Adapter
	HBMB-	\$-	*6/83	-	Multibus Repeater
Ikon Corporation ..... (206) 624-3410	10077	\$2150	6/82	stk	DEC DR11-W Emulator
	10077-NSC	\$2150	*11/82	stk	Hyperchannel Adapter Interface
Intel Corporation ..... See Sales Office Listing	iSBC 310A	\$1100	-	-	Math Processing
LeCroy Research .....	1506	\$495	-	-	Display Board
Linear Systems, Ltd. .... (204) 774-7991	LS7482	\$376	5/82	stk	Clock/Calendar
Marinco, Inc. .... (619) 453-5203	APB-3000	\$4250	*3/83	30da	Array Processor



### Distinguishing Features

Multibus board with 6 8/16-bit SBX connectors and interrupt controllers.

On bus signal analyzer with cycle buffering 1024-4096 cycles. Built-in bus termination, user selectable.  
Power failure detect indicator.

Multibus adapter makes the IBM PC I/O compatible with the IEEE 796.

Rechargeable battery, provides second, min., hr., day, month, year.

Fast Fourier transform, single card, up to 6 million multiplications and additions per second, FFTs from 16 to 1024 points, on-board DMA control, also supports double precision arithmetic. Requires 16-bit Multibus processor.

12 million operations per second, on-board DMA, 24-bit address.

Multibus interface for Reticon imaging cameras.

Occupies one slot; programs 2716, 2732, 2732A, 2764 EPROMS, 8 detachable ZIF sockets, use Friendly Software support available on diskette for either CPM or ISIS; 8 or 16-bit words.

Conforms to VERSAbus spec. M68KVBS(D4) and Multibus spec. Rev.-03, 4/81; master, slave master/slave operation; buffered address and data buses.

Asynchronous bi-directional Multibus repeater - Supports 24-bit addressing - 30ns delay time, power on/off detection, with or without bus switching.

Complete DEC DR11-W emulation, including Multibus/UNIBUS interprocessor links; 8/16/20/24 bit addressing; 2Mbyte/sec DMA (including arbitration between cycles) with 24-bit linear address; high bus efficiency; multi-network gateway. Contact factory for custom interfaces.

Interface to Network Systems Corp. Hyper-channel Adapter; 8/16/20/24 bit addressing; 2Mbyte/sec DMA transfer rate (including arbitration time between cycles) with 24-bit linear address; high bus efficiency. Contact factory for custom interfaces.

Arithmetic slave processor; floating point math 32-bit format; fixed point integer math in 16-32-bit formats. Reference: iSBC 337, iSBX 332, and iSBX 331, numeric processor and Multimodule boards.

Provides static and dynamic displays of program execution for debugging.


iSBX-Module, single wide, programmable alarms, 1 yr. calendar.

FFT, inverse FFT, power spectral density, autocorrelation; solves autocorrelation matrix (Toeplitz), digital filtering, (cross correlation). Optional RAM version, 24-bit floating point.

continued next page

## Other Functions

Manufacturer	Model	Price	DFA	Deliv.	Type
Medinova Corporation ..... (312)870-0855	MSBX-241	\$355	*1/83	stk	Real-Time Clock Calendar
Micomp Development Corporation .....	MX-201	\$295	*4/83	-	Clock/Calendar
Micro/Sys .....	MC1460	\$395	9/78	15da	Clock/Calendar
Monolithic Systems Corp. .... (303)770-7400	MSC8901	\$820	-	-	Memory Manager
Morrow Computer .....	SB-1004	\$495	6/80	stk	Supervisory Board
Morrow Computer .....	SB-1004	\$495	6/80	stk	Supervisory Board
National Semiconductor .....	BLX-331	\$450	-	-	Fixed/Floating Point Math
See Sales Office Listing					
Proclise Corporation .....	REPEATER	\$795	*2/83	4wk	Bus Repeater
(206)392-0270					
Proteon Associates .....	PRO 80	\$1300	10/78	30da	Frequency Synthesizer
(617)894-1980					
	PRO 88	\$1500	12/80	30da	Frequency Synthesizer
Sky Computers .....	SKYMNK-M	\$5990	3/82	30da	Array Processor
	SKYFFP	\$2200		-	Floating Point Processor
TITN, Inc. ....	T/N/03	\$1000	81	6wk	Multiple Multibus Adapter
(415)348-9181					
(612)831-4422					
Zendex .....	ZX-906B	\$495	1/80	stk	Multibus Display Board
(415)828-3000					
	ZX-907	\$2895	6/82	stk	Multibus Tracer Board
	ZX-908A	\$720	-	stk	EPROM Programmer
	ZX-914	\$895	*3/83	stk	EPROM Programmer
	ZX-909	\$720	-	stk	EPROM Programmer



## Distinguishing Features

Accurate time-of-day/calendar data w/o wait states, non-volatile registers select daylight savings option, 12/24 hr. BCD/binary data, alarm and periodic interrupt sources. Includes 50 bytes of NVRAM.

SBX MULTIMODULE.

SBX MULTIMODULE, battery protected.

Timekeeping board with month, day, hours, minutes and seconds ports.

Battery powered time-of-day clock; programmable real-time interrupt; parallel bus master arbitration logic capable of controlling 8 bus masters; memory extender/page mapper logic extends addressing to 24-bit physical addressing.

Automatically resets Multibus system after failure; alarm output for non-recoverable failures; real-time interrupt; 24 user-defined indicators/switches.

Expansion Module.

MULTIMODULE, repeats Multibus signals into additional card cages. 24-bit address 16-bit data, 2 board set with cables.

Frequency range 10 Hz to 2 MHz; resolution 0.0023 Hz; phase continuous, transient free switching, less than 40  $\mu$ sec to update.

Frequency range 25 Hz to 200 MHz; resolution 10 KHz to 1.25 MHz; includes SSB mixer to implement step and repeat synthesizers.

For Intel 8086 or Motorola 68000 based systems.

32-bit and 64-bit precision floating-point operations.

Multibus adaptations for connection between master rack and slave rack for orders, data and 18 IT.

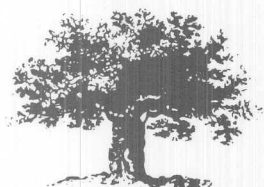
Displays address, data and control signals; hardware single step stop; binary event match counter and display, bus voltage indicators.

Captures up to 1024 bus event cycles. The events may be displayed on a CRT as requested by break points.

Programs up to 16Kbytes of 2716, 2732 or 2732A at one time. Optional version with ZIF sockets mounted on separate PC board, programs up to 4Kbytes.

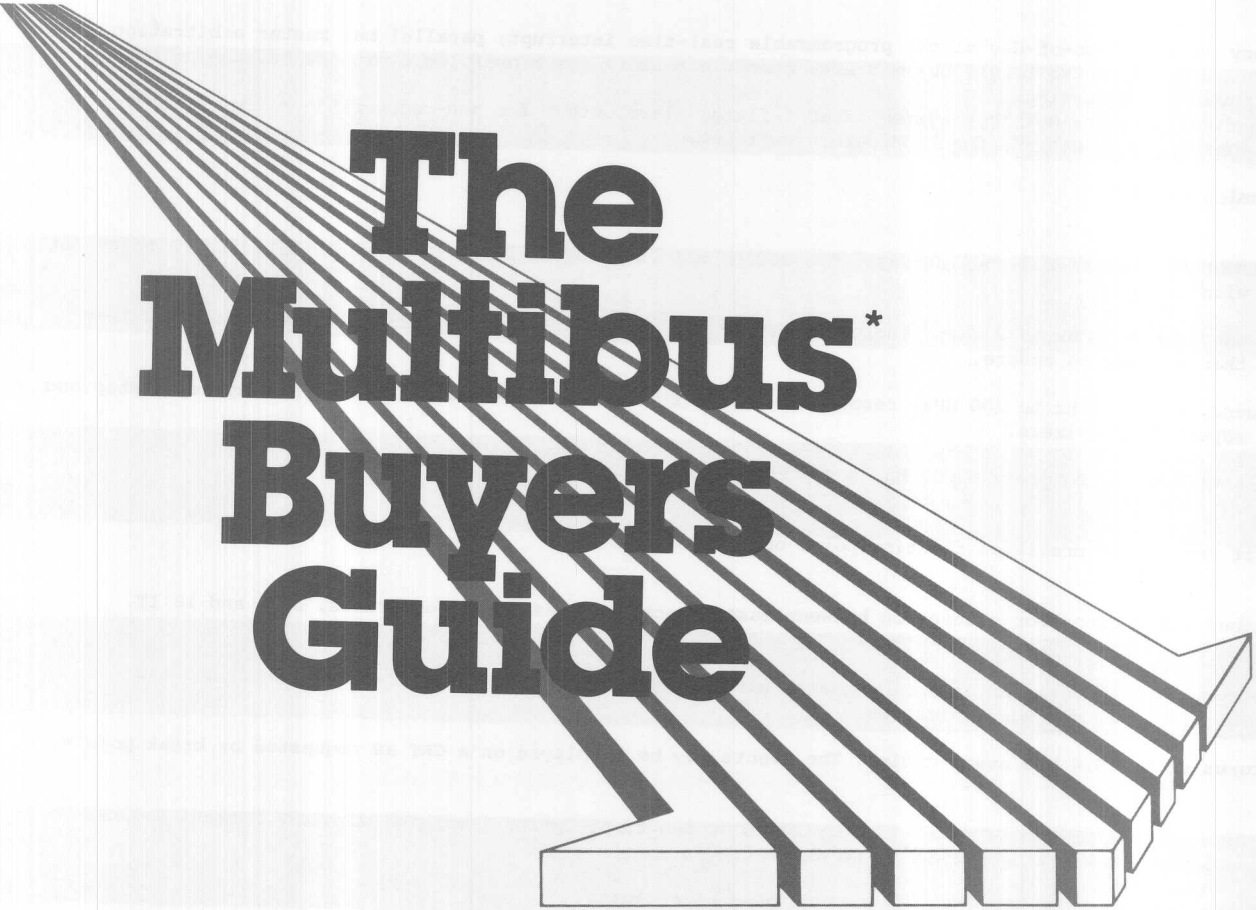
Will program 2764, 27128 and 2816. Will do gang programming.

Same as ZX-908A except the ZIF sockets are mounted on separate PC board. 2 sockets to program up to 4Kbytes.



**IRONOAK COMPANY**

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(619) 450-0191

A graphic consisting of numerous parallel lines that converge from the left towards the right, creating a strong sense of perspective. At the bottom right, these lines form a 3D arrow pointing horizontally to the right.

# **The Multibus<sup>\*</sup> Buyers Guide**

\*Multibus™ is a trademark of Intel Corporation



# Intelligent Analog I/O

Data Translation, Inc.  
ETI Micro  
Heurikon Corporation  
Intel Corporation  
J & H Manufacturing  
Robotrol Corp

## Intelligent Analog I/O

Manufacturer	Model	Price	DFA	Deliv.	Input S.E.	Ch. Diff.	CMRR (db)	CMV	PGA	Input Ranges (Volts FS)	Resolution (bits)
Data Translation ..... (617)481-3700	DT3752	\$1895	-	5 da	16	8	76	<u>+10</u>	*	<u>+10</u>	12 14* 16*
	DT3772	\$595	-	5 da	48	24	76	<u>+11</u>	-	-	-
	DT3754	\$1895	-	5 da	16	8	80	<u>+10</u>	*	10mV to 10V	12 14* 16*
	DT3774	\$595	-	5 da	48	24	80	<u>+11</u>	-	-	-
	DT3755	\$1895	-	5 da	-	4	126	<u>+250</u>	*	10mV to 10V	12
	DT3775	\$695	-	5 da	-	8	126	<u>+250</u>	-	-	-
	DT3762	\$1575	-	5 da	-	-	-	-	-	-	-
ETI Micro ..... (415)829-6600	8131	\$900	1/82	stk	-	16	64	<u>+10</u>	o	+5,+10 4-20mA	12 dual slope
Heurikon Corporation ..... (608)271-8700	MLZ-DAQ	\$1895	-	-	32	16	-	-	o	<u>+10</u>	12
Intel Corporation ..... See Sales Office Listing	iSBC 88/40	\$2000	-	-	32	16	-	<u>+10</u>	o	<u>+5</u>	12
J & H Manufacturing ..... 21545		\$-	-	-	8	-	-	-	-	-	-
Robotrol Corp. .... (408)732-8813	RMB 741	\$1210	2/82	stk	32	16	60	<u>+20</u>	o	<u>+10</u> 0-20,50mA*	12

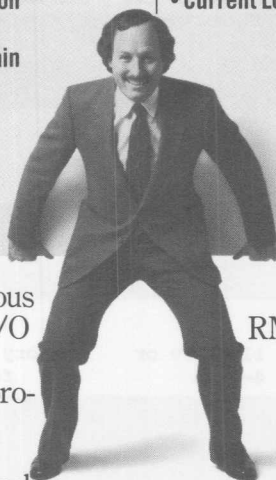
Conversion Time(μsec)	Throughput Rate (KHz)	Micro-processor	I/O Serial RS232C	Conv. DC/DC	Output Channels/Type	Distinguishing Features
28.5	35 125*	8085A	1 20mA*	o	-	16K dual-port RAM; 16K EPROM capacity; DMA capability; 2 programmable real time clocks.
-	-	N/A	-	o	0,4or8/DAC V or 4-20mA	DT3752 expander, system capacity 64 S.E. or 32 Diff.
32	35	8085A	1 20mA	o	-	Same as DT3752 except low level, wide range inputs.
10V range	-	N/A	-	o	0,4or8/DAC V or 4-20mA	DT3754 expander, system capacity 64 S.E. or 32 Diff.
-	20/sec	8085A	1	o	-	Same as DT3752 except isolated low level, wide range.
-	-	N/A	-	o	0,4or8/DAC V or 4-20mA	DT3755 expander, 8 differential (up to 60 channels total with DT3755 and 7 units of DT3775).
-	-	N/A	1 20mA	o	4/DAC,12-bit 48/TTL prog.	Expands functional capability of DT3752-54-55; 5 16-bit counter timers; 2 ROM/EPROM sockets. Optional floating point math.
70msec	14/sec	8085A	-	o	-	2K dual-port RAM; inputs protected to 120V; resident firmware, transient protected; +5V only.
-	-	280A	4	-	-	
50	18	8088	iSBX351 or 352	-	24/parallel lines	9 level interrupt, 3 SBX connectors; optional 8087.
-	-	-	-	-	-	
25	23	8048	-	o	12/DAC v or 4-20mA	Memory mapped with 20-bit address. Consult factory for other I/O ranges.

# “When it comes to MULTIBUS™ Analog I/O, who else could hold up a chart this big?”

Fred Molinari, President

## MULTIBUS COMPATIBLE BOARDS & SOFTWARE

	LOW COST (12 to 16-Bit Resolution)	INTEL RMX-80™ AND RMX-86™ COMPATIBLE (12-Bit Resolution)	INTELLIGENT ANALOG PERIPHERALS (12 to 16-Bit Resolution 8085 CPU, 16KB Dual Port RAM)
ANALOG INPUT (16 to 64 Channels)	DT1742 High Level DT1744 Low Level DT1748 Isolated Low Level	DT711 32-Channel	DT3752 High Level DT3754 Low Level DT3755 Isolated Low Level
ANALOG OUTPUT (12-Bit)	DT1841 2-Channel Point Plotter DT1842 8-Channel DT1843 8-Channel (8-Bit)	DT724 4-Channel  DT728 8-Channel	DT3776 8-Channel Expander DT3762 Multifunction Expander
ANALOG I/O 16 Inputs 2 Outputs	DT1751 High Level DT1755 Low Level DT1759 Isolated Low Level	DT732 32 inputs/ 2 outputs	
OTHER FEATURES	<ul style="list-style-type: none"> <li>• Analog Expansion</li> <li>• Current Loop Option</li> <li>• Up to 125kHz A/D</li> <li>• Programmable Gain</li> </ul>	<ul style="list-style-type: none"> <li>• Programmable Gain</li> <li>• Current Loop Option</li> </ul>	<ul style="list-style-type: none"> <li>• DTFIRM Measurement &amp; Control Firmware</li> <li>• Digital I/O</li> <li>• Current Loop Option</li> <li>• Up to 100kHz A/D</li> <li>• Monitor ROM</li> <li>• Programmable Gain</li> <li>• On-Board Serial I/O</li> <li>• Analog Expansion</li> </ul>



As you can see, we have an enormous line of MULTIBUS compatible analog I/O systems.

High-level, low-level, isolated, and programmable gain. Up to 64 A/D channels on a single board.

Our line includes the Intelligent Analog Peripheral, the most powerful and flexible analog I/O product available on MULTIBUS.

The one-of-a-kind IAP was our invention. You'll find that each of our boards is unique in its ability to solve real world problems.

Take flexibility. Thanks to their modular design, our boards can be enhanced for higher speeds and resolution simply by plugging in a Datas II module.

Many of our boards are compatible with RMX-80 software. All are designed to work with our new line of signal conditioning products.

Further, we offer firmware for data acquisition software development. DTFIRM for

general purpose data acquisition. And DTTHERM for thermocouple linearization.

Most important perhaps, we will deliver any board within *five* days.

We hold up a big chart, but we'll never hold *you* up.



For a copy of our 336 page catalog call Data Translation. Or turn to Volume III of the Gold Book.

# DATA TRANSLATION

**World Headquarters:** Data Translation, Inc., 100 Locke Dr., Marlboro, MA 01752 (617) 481-3700 Tlx 951-646.  
**European Headquarters:** Data Translation, Ltd., 430 Bath Rd., Slough, Berkshire SL1 6BB England (06286) 3412 Tlx 849-862.  
 MULTIBUS, INTEL RMX-80 and RMX-86 are trademarks of Intel Corporation.



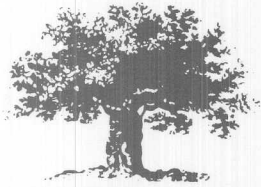
## Analog I/O Combination

ADAC Corp.  
Analog Devices  
Burr-Brown  
Data Translation, Inc.  
Datel/Intersil  
Distributed Computer Systems  
Diversified Technology, Inc.  
EMM/Sesco  
Robotrol Corporation  
Zendex Corporation

## Analog I/O Combination

Manufacturer	Model	Price	DFA	Deliv.	Input Diff.	Ch. S.E.	Input Ranges (Volts FS)	Resolution (12 bits)	PGA	CMRR (db)	CMV
ADAC .....	735 A/D/A	\$620	-	-	8 32*	16 64*	$\pm 10$ 0-20,50mA*	o	*	-	$\pm 5$
Analog Devices ..... (617)329-4700	RTI-732	\$745	6/82	stk/ 2wk	16	32	$\pm 5, \pm 10, \pm 5, \pm 10$ 4-20mA	12	1,2,4,8	60	$\pm 10.24$
Burr-Brown ..... (602)747-0711	MP8418-AO	\$795	-	-	15 63*	31 127*	$\pm 10$	o	*	74	$\pm 26$
	MP8608-AO	\$625	-	-	8 32*	16* 64*	$\pm 5$	8	-	66	$\pm 15$
Data Translation ..... (617)481-3700	DT1751	\$795	-	5 da	8 32*	16 64*	$\pm 10$ 4-20mA*	o 14*16*	*	-	-
	DT1755	\$895	-	5 da	8	16	$\pm 10$	o 14*16*	*	-	-
	DT1759	\$1175	-	5 da	4 60*	-	$\pm 10$	o	*	166	$\pm 250$
	DT732	\$795	-	5 da	16	32	$\pm 10$ 4-20mA*	o	*	-	-
Datel/Intersil ..... (617)339-9341	ST-732	\$788	-	-	16	32	$\pm 10$	o	o	100	$\pm 12$
Distributed Computer ..... (617)899-6619 (800)225-4589	DCS 732	\$1200	-	-	16	32	$\pm 10$ 4-20mA*	o	*	-	-
Diversified Technology .... (601)856-4121	CBC 8731-2	\$1340	6/82	stk	8 16*	16 32*	$\pm 10$	o	o	80	$\pm 10$
EMM/Sesco .....	SECS-80/732	\$4700	-	-	-	-	-	-	-	-	-
Robotrol Corporation ..... (408)732-8813	RMB-730	\$1050	81	2 wk	8 16*	16 32*	$\pm 10$ 0-20,50mA*	o	o	60	$\pm 20$
Zendex Corproation ..... (415)828-3000	ZBX-324	\$291	-	stk	-	o	$\pm 10$	8	-	-	-

Conversion Time (usec)	Throughput Rate (KHz)	DC/DC	Ch.	Output Resol.	Range	Distinguishing Features
-	35	*	1	12	$\frac{+10}{4-20mA^*}$	Choice of program control or program interrupt; compatible with SBC 80/10, 80/20; MDS-800
25	2	*	2	12	$\frac{+10}{4-20mA^*}$	Direct plug-in replacements with industry standard 711/724/732 analog I/O boards. Memory-mapped 20, 22, or 24-bit addressing, requires +5V.
-	38	o	2	12	$\frac{+10}{4-20mA^*}$	Software PGA; expandable to 127 SE channels with MP8418-EXP or 63 different channels with isolated MP8418-ISDE; thermocouple inputs available.
44	-	o	2	8	$\frac{+10}{4-20mA^*}$	
-	35 100*	o	2	12	$\frac{+10}{4-20mA^*}$	Point plotting
-	35 100*	o	2	12	$\frac{+10}{4-20mA^*}$	Low level board, point plotting.
-	-	o	2	12	$\frac{+10}{4-20mA^*}$	Point plotting, integrating A/D, flying capacitor switching; isolated; thermocouple input terminal available.
-	24	o	2	12	$\frac{+10}{4-20mA^*}$	Compatible with SBC 732; pacer clock.
23	20	o	2	12	$\frac{+10}{4-20mA^*}$	
-	35	-	2	12	-	
24msec	41 Hz	*	2 1*	12	$\frac{+10}{4-20mA^*}$	CMOS technology for low power operation; 1.8W of power dissipation. 11 Range PGA, RMS to DC converter option. Industrial version available.
-	-	-	-	-	-	MIL-Spec. version of iSBC 732.
25	23	o	12	12	$\frac{+10}{4-20mA^*}$	Memory-mapped with 20-bit address. Consult factory for other I/O ranges.
18	-	-	2	8	10 or 2.6V	SBX Module; compatible with SBC 80/10B and 80/24; 15V not required.



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La Jolla, CA 92037  
(619) 450-0191

A graphic consisting of numerous parallel lines that converge towards the top left corner, creating a strong sense of perspective. At the bottom right, these lines transition into a series of vertical bars of increasing height, resembling a 3D bar chart.

# **The Multibus<sup>\*</sup> Buyers Guide**

\*Multibus™ is a trademark of Intel Corporation



# Analog Input

ADAC, Inc.  
 Analog Devices  
 Burr-Brown  
 Data Translation, Inc..  
 Datal/Intersil  
 Distributed Computer Systems  
 Diversified Technology  
 Intel Corporation  
 Megalogic Corporation  
 Monolithic Systems  
 National Semiconductor Corp.  
 Robotrol Corp.

## Analog Input

Manufacturer	Model	Price	DFA	Deliv.	Input Ch.		Input Voltage Ranges (V)				Resolution (12 bits)	PGA
					Diff.	S.E.	+5	+5	+10	+10		
ADAC .....	735 A/D	\$495	-	-	8 32*	16 64*	o	o	o	o	o	*
	710	\$845	-	-	8	-	10 to 500mV FS				o	o
Analog Devices ..... (617)329-4700	RTI-1200	\$699	9/77	stk	8 16*	16 32*	0-10V, +5V, +10V				o	o
	RTI-1202-R	\$485	9/77	stk	8	16	10mV FS to +10 FS				o	o
	RTI-711	\$645	6/82	stk/ 2wk	16	32	0-5V, 0-10V, +5V, +10V				12	1,2,4,8
Burr-Brown ..... (602)747-0711	MP8409-NS	\$585	-	-	8	- 16*	+10mV to +10V				o	o
	MP8608	\$470	-	-	8	- 16*	+10mV to +5V				8 12*	-
	MP8418	\$595	-	-	15 48*	31 96*	+10mV to +10V				o	*
	MP8418-15OE	\$695	-	-	16 63*	-	+10mV to +10V				-	-
	MP8632	\$590	-	-	32	64	+10mV to +5V				8	-
	MP8430	\$750	-	-	16	-	RTD inputs (3-wire)				o	-
Data Translation ..... (617)481-3700	DT0711	\$645	-	5 da	16	32	o	o	o	o	o	o
	DT1748	\$775 \$1175*	-	5 da	-	12	+10mV				o	*
	DT1742	\$495	-	5 da	8 32*	16 64*	o	o	o	o	o	-
	DT1744	\$595	-	5 da	8	16	10mV to 10V				o	*
	DT712	\$795	*	5 da	8 64*	16 128*	-	-	o	o	o	1,2,4,8

CMRR (db)	CMV	Conversion Time (usec)	Throughput Rate (KHz)	DC/DC	Data Bus/ Address (bits)	Distinguishing Features
70	±5	-	35	*		
-	±250	5msec	-	*		Expandable to 128 channels; flying capacitor switching; direct thermocouple measurement.
75	±10	25	28	*		Intel SBC-8/10, 80/20 and MDS compatible. Memory-mapped I/O interface.
74	±10	25	40	*		Expandable to 256 channels; compatible with iSBC-80.
60	±10.24	25	40	o		Memory-mapped I/O, 20, 22, or 24-bit addressing; single +5V operation.
-	-	33	-	*		
-	-	44	-	o		
-	-	38	-	o		Memory-mapped; optional software programmable gain (1-1024); connector kits and cable assemblies available.
-	-	-	18msec	o		Flying capacitor isolation; 400V channel to channel isola- tion; compatible with Intellec MDS and iSBC.
-	-	44	-	o		
-	-	25	-	-		RTD input board; includes RTD signal conditioning and line length compensation; 100 or 1000 ohm.
-	-	-	24	o		Plug compatible with SBC 711.
-	-	-	-	o		
-	-	30	35	o		
-	-	40	-	o		
80	±11	-	25	o	8-16/20	Memory or I/O mapping, 512SE/256 Diff. max. input 2 board set, option DT714 for low level inputs.

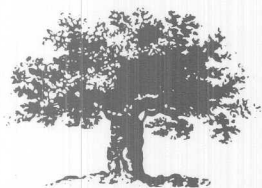
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## Analog Input

Manufacturer	Model	Price	DFA	Deliv.	Input Ch.		Input Voltage Ranges (V)				Resolution (12 bits)	PGA
					Diff.	S.E.	+5	+5	+10	+10		
Datel/Intersil ..... (617)339-9341	ST-711	\$624	-	-	16	32	o	o	o	o	o	o
	ST-800-16S	\$720	-	-	8* 16*	16 32*	o	o	o	o	o	-
	ST-711 RLY	\$968	-	-	8 16*	-	10mV to 2V				o	-
Distributed Computer .... (617)899-6619 (800)225-4589	DCS 711	\$1000	-	-	16	32	o	o	o	o	o	-
	DCSFC8D	\$850	-	-	8 16*	-	-	-	-	-	-	-
Diversified Technology .. (601)856-4121	CBC 8731-0	\$920	6/82	stk	8 16*	16 32*	±10mV to ±10V				o	o
Intel Corporation ..... See Sales Office Listing	iSBX 311	\$610	-	-	8 16*	16 32*	o	o	-	-	o	o
Megalogic .....	GAB-1/MN	\$395	-	2wk	-	4	0 to ±4.095V				o	-
Monolithic Systems ..... (303)770-7400	MSC 8111	\$819	-	-	-	16	o	o	o	o	o	o
National Semiconductor .. See Sales Office Listing	BLC-8737-1	\$729	-	stk	16 32*	8 16*	o	o	o	o	o	o
Robotrol Corp. .... (408)732-8813	RMB-720	\$645	81	2wk	8 16*	16 32*	o	o	o	o	o	o

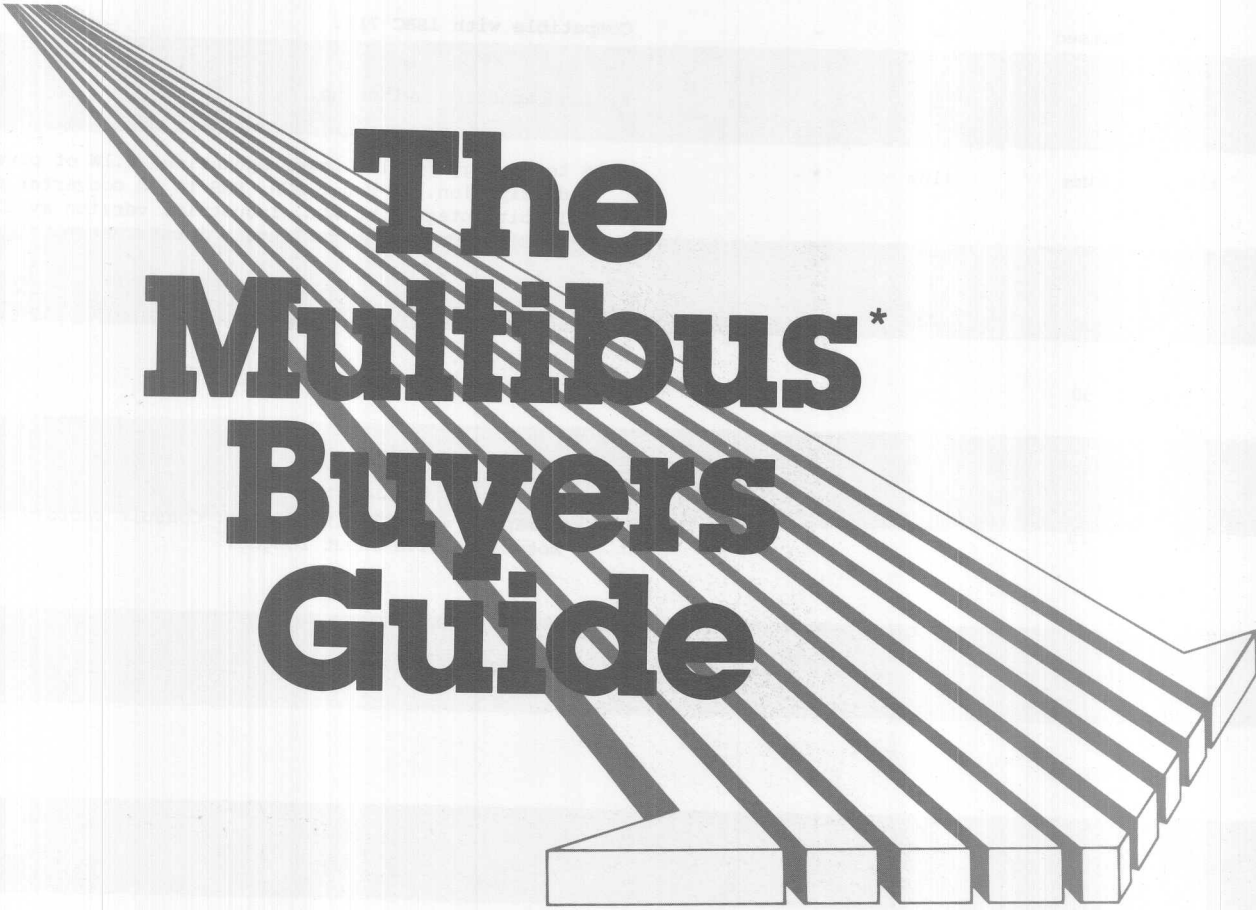


CMRR (db)	CMV	Conversion Time (usec)	Throughput Rate (KHz)	DC/DC	Distinguishing Features
80	±35	20	23	o	+5 volts only.
-	±35	20	23	o	+5 volts only; DMA.
126	±250	-	30/sec	N/A	Includes 10-stage pacer clock; external scan start; flying capacitor relay multiplexer.
-	-	50msec	-	-	Compatible with iSBC 711.
-	±250	-	-	o	Flying capacitor switching.
80	±10.24	24ms	41Hz	*	CMOS technology for low power operation; 1.1W of power dissipation. 11 Range PGA. RMS to DC converter option. 12-bit integrating ADC. Industrial version available.
-	±30	50	18	o	Multimodule, 20mV to 5V full scale input ranges.
-	-	20	23	o	
-	-	50	o	o	
60	-	-	-	-	
60	±20	25	23	o	Memory-mapped with 20-bit address. Consult factory for more sensitive input ranges.



**IRONOAK COMPANY**

3239 Caminito Ameca  
La Jolla, CA 92037  
(619) 450-0191

A graphic consisting of numerous parallel lines that recede into the distance, creating a strong sense of perspective. The lines are arranged to form a series of steps or a staircase that leads towards the horizon.

# **The Multibus<sup>\*</sup> Buyers Guide**

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## Analog Output

ADAC Corp.  
Analog Devices  
Anitech Systems, Inc.  
Burr-Brown  
Data Translation, Inc.  
Datel/Intersil  
Diversified Technology, Inc.  
EMM/Sesco  
ETI Micro  
Intel Corporation  
Monolithic Systems  
Robotrol Corp.

## Analog Output

Manufacturer	Model	Price	DFA	Deliv.	No. of Channels	Output ±2.5	Output +5	Output ±5	Output +10	Output ±10	Current 4-20mA	Resolution (12 bits)
ADAC .....	735 DAC	\$310	-	-	1 (2,3,4)*	o	o	o	o	o	*	0
Analog Devices .....	RTI-1201-040 (617) 329-4700	\$489	9/77	stk	2 8*	o	o	o	o	o	*	o
	RTI-724	\$495	6/82	stk/ 2wk	4	-	o	o	o	o	*	o
	RTI-724-V	\$495	6/82	stk	4	-	o	-	o	o	-	o
Anitech Systems Inc..	1002	\$750	1/82	2wk	16	-	-	-	o	-	-	8
Burr-Brown .....	MP 8305-NS (602) 747-0711	\$550	-	-	4	-	-	-	-	o	-	o
	MP 8316-I	\$650	-	-	16				N/A		o	o
	MP 8316-V	\$550	-	-	16	o	o	o	o	o	N/A	o
Data Translation ....	DT0724 (617) 481-3700	\$595	-	5da	4	-	o	o	o	o	o	o
	DT1841	\$495	-	5da	2	-	o	o	o	o	-	o
	DT1842	\$995	-	5da	8	-	-	-	o	o	o	o
	DT1843	\$745	-	5da	8	-	-	-	o	o	o	8
	DT728	\$745		5da	4 8*	-	o	-	o	-	*	o



Conversion Time (usec)	DC/DC	+5V Only	Data Bus/ Address (bits)	Distinguishing Features
-	*	-		
5	*	-		Four independent output channels; optical V/I converter (4-20mA output); memory-mapped 16-bit address.
5	o	o		Memory-mapped, I/O, 20, 22 or 24-bit addressing, on-board DC/DC.
-	o	o		Same as RTI-724 except voltage output only.
-	-	-		Memory or I/O mapped.
10	*	*		Individual DACs; connector kits and cable assemblies available.
3.5	o	o		Single D/A drives 16 outputs; data for each channel stored in RAM and selected without host intervention; memory or I/O mapped; 20-bit address.
3.5	o	o		Same as MP 8316-I except voltage outputs.
4	o	o		Direct replacement for SBC 724.
3	o	o		
3	o	o		
1	o	o		
2.5	o	o	8-16/20	

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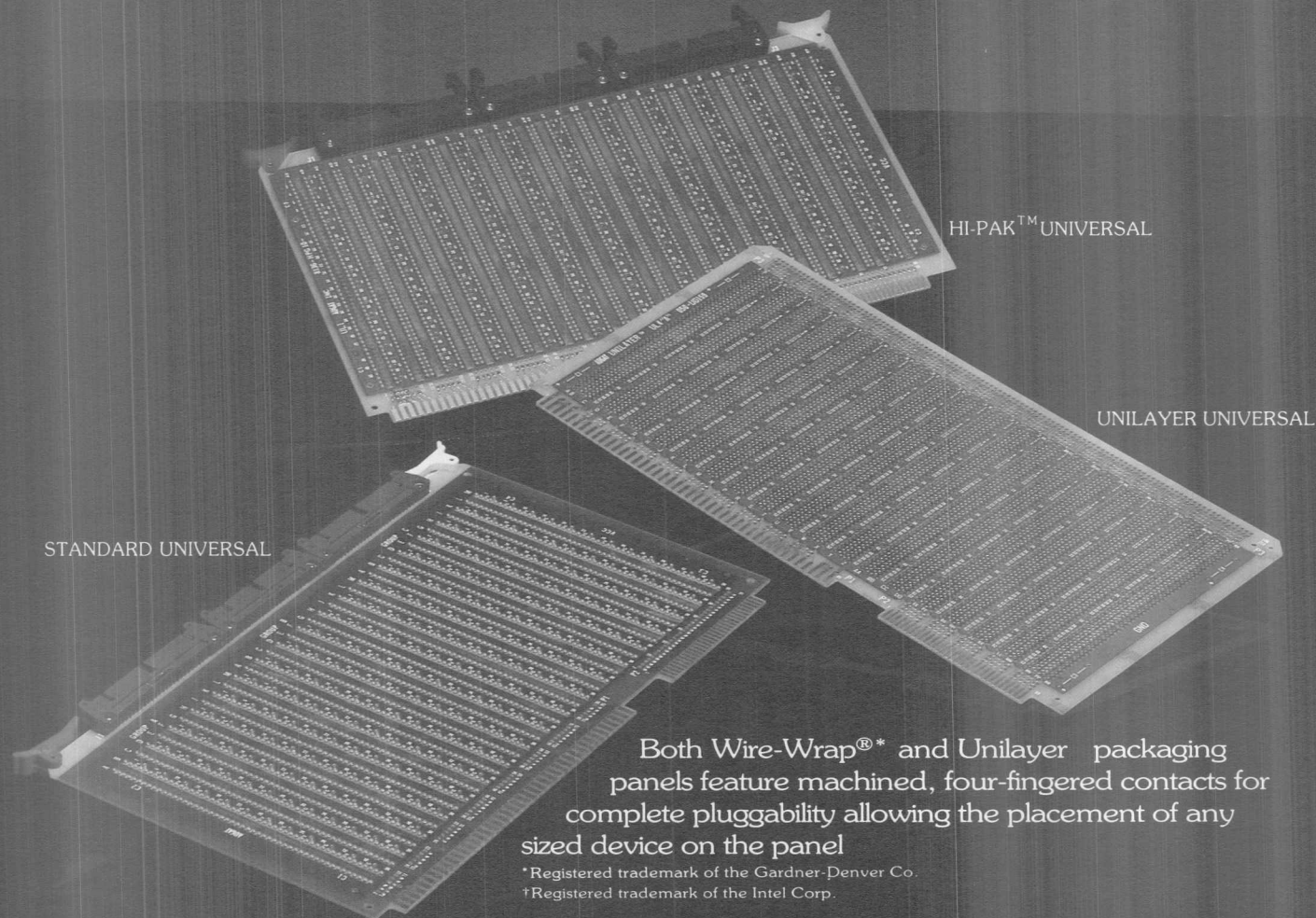
## Analog Output

Manufacturer	Model	Price	DFA	Deliv.	No. of Channels	Output ±2.5	±5	±5	±10	Voltage (V) ±10	Current 4-20mA	Resolution (12 bits)
Datel/Intersil ..... (617) 339-9341	ST-800-16D	\$775	-	-	16	o	o	o	o	o	-	o
	ST-724	\$575	-	-	4	-	o	o	o	o	o	o
	ST-716A1	\$690	9/82	-	4 8*	-	-	o	o	o	-	16
	ST-728A	\$545	-	-	4	-	o	o	o	o	o	o
Diversified Technology (601) 856-4121	CBC8730-2	\$720	6/82	stk	2	o	o	o	o	o	o	o
EMM/Sesco .....	SECS 80/724	\$4450	-	-	4	-	o	o	o	o	o	o
ETI Micro .....	8135 (415) 829-6600	\$1480	1/82	stk	8	-	o	-	o	-	o	o
Intel Corporation .... See Sales Office Listing	iSBX 328	\$750	-	-	8	o	o	o	-	-	o	o
Monolithic Systems ... (303) 770-7400	MSC 8110	\$744	-	-	4	-	-	-	-	-	-	o
Robotrol Corp. .... (408) 732-8813	RMB-710	\$745	81	stk	12	o	o	o	o	o	o	o

Conversion Time (usec)	DC/DC	+5V Only	Data Bus/ Address (bits)	Distinguishing Features
4	*	o		Expandable channel increments to 256 channels; DMA capability; scan by: programming, on-board timer, external pulse.
4	o	o		Direct replacement for SBC 711/732.
o	*	*		8-16-bit CPUs 20-bit addressing; memory-mapped; accurate to 0.005% of FS reading.
5	*	o		Compatible with 8 and 16-bit CPUs; optional 8 D/A channels/board; overall accuracy $\pm 0.05\%$ FS.
-	o	o		CMOS technology for low power operation; 1.1W of power dissipation. Industrial version available.
-	-	-		MIL-Spec. version of BLC-724.
-	o	o		Both voltage and current output provided for each channel; meets IEEE 472-1974 surge withstand.
20	o	-		Multimodule, intelligent interface with programmable offsets.
4	-	-		
-	o	-		Voltage or current loop selectable version available. Memory-mapped with 20-bit address. Consult factory for other output ranges.



# AUGAT UNIVERSAL MULTIBUS®† PANELS FOR CUSTOM CIRCUIT DESIGNS



HI-PAK™ UNIVERSAL

UNILAYER UNIVERSAL

STANDARD UNIVERSAL

Both Wire-Wrap®\* and Unilayer packaging panels feature machined, four-fingered contacts for complete pluggability allowing the placement of any sized device on the panel

\*Registered trademark of the Gardner-Denver Co.

†Registered trademark of the Intel Corp.

## WIRE-WRAP PACKAGING PANELS

Augat wire-wrap panels are available with both 1½, 2, and 3 level posts. ICs are plugged directly into the machined internal contacts and the opposite side may be either hand or machine wired

- Stocked by local electronic distributors
- Ideal for fast circuit design where long-term reliability is required
- Chip capacity: HI-PAK™ Universal (8136-HPG10) 132 16-pin DIPs  
Standard Universal (8136-UG159) 90 16-pin DIPs
- For more information request Augat's Engineering Product Guide G100

## UNILAYER™ PACKAGING PANEL

Unilayer is a discrete wiring system which combines components and wiring on the same side. Wiring is produced by soldering a 38 AWG polyurethane insulated copper wire to wiring pads common to the IC leads

- Stocked at Augat's wiring facilities in California, Texas and Massachusetts
- Low cost and low profile make Unilayer ideal for volume requirements
- Chip capacity: Unilayer universal (050-UG159-HC) 108 16-pin DIPs
- For more information request Augat's Unilayer Design Guide

**AUGAT®**

INTERCONNECTION SYSTEMS DIVISION

40 Perry Avenue, P.O. Box 1037, Attleboro, Massachusetts 02703 (617) 222-2202

AUGAT DATATEX 10935 So. Wilcrest Dr., Houston, Texas 77099 (713) 495-3100

AUGAT DATATEX INC. 14751 Califa St., Van Nuys, California 91411 (213) 786-3974



## Prototyping Boards

Advanced Micro Devices  
Artec Electronics  
Augat Interconnection Systems  
Central Data Corporation  
Chen Digital Laboratories  
Comark Corporation  
Douglas Electronics, Inc.  
EECO Incorporated  
Electronic Solutions  
ETI Micro  
Garry Electronics  
General Digital Corp.  
Hybricon Corp.  
Intel Corporation  
Logitech, Inc.  
Matrox Electronic Systems  
MDB Systems  
Metacomp, Inc.  
Methode Electronics  
Monolithic Systems  
Mupac Corporation  
National Semiconductor Corp.  
Prototek, Inc.  
Scanbe, Div. of Zero  
Schneider Instruments  
Vector Electronics  
Vero Electronics  
Zendex Corporation

## Prototyping Boards

Manufacturer	Model	Price	DFA	Deliv.	No. Columns	16-Pin DIP Capacity	Edge Connector (No./Pins)
AMD ..... (408) 988-7777	AM95/6410	\$185	-	stk	-	-	-
Artec Electronics .....	Multi-Circuit	\$65	-	-	-	130	1/50, 1/40, 1/26
	Multi-Purpose	\$150	-	-	-	95	-
Augat ..... (617) 222-2202	8136-UG159	\$402	75	stk	36	90	2/50, 1/40 WW headers
	050-UG159	\$143	-	2wk	36	108	Any combination; flat cable headers 1/40, 2/50
	813-HPG16	\$-	9/82	stk	44	132	
Central Data ..... (217) 359-8010	B1011	\$95	3/80	stk	-	95	2/50
Chen Digital Laboratories .....	D1003-X	\$75	3/82	stk	-	65	4 configurations
	DSGN-X	\$95	3/82	stk	-	78 14-pin	3 configurations
Comark Corporation ..... (617) 894-7000	MB-WWC	\$150	-	-	13	-	4/50
Dawn Technology, Inc. .... (408) 980-1122	Protoboard	\$98	★ 3/83	stk	-	-	-
Douglas Electronics, Inc. .... (415) 483-8770	32-DE-16	\$63	1/81	stk	19	95	
	32-DE-16-W	\$143	1/81	stk	19	95	
	12-DE-16	\$55	1/81	stk	-	-	
	12-DE-16-P	\$153	1/81	stk	-	-	
	12-DE-16-B	\$16	6/82	stk	-	-	
	12-DE-16-A	\$20	6/82	stk	-	-	
EECO Incorporated .....	-80-01	\$155	12/79	stk	-	132	2/50, 1/26, 1/86, 1/60

## Distinguishing Features

Universal wire wrap prototyping board; edge connector pins, power pins, ground plane and plastic protector.

Buffering and control logic for Multibus slave interface prototyping.

Buffering and control logic; 16-bit address; 16-bit data.

Standard universal WW packaging panel. Devices with between row spacing of .3", .6" or .9", may be plugged into the panel at any location, with decoupling capacitor sites next to each device.

Unilayer, universal packaging panel. Devices with between row spacing of .3", .6" or .9", may be plugged into the panel at any location, with decoupling capacitor sites next to each device.

Hi-Pak, universal packaging panel. Devices with between row spacing of .3", .6" or .9", may be plugged into the panel at any location, with decoupling capacitor sites next to each device.

Sockets with pin spacings of .3" and .6".

Includes P1 and P2 connectors. Layed out for 20-pin dual inline devices, .3", .6" and .9" centers.

Multibus compatible wire-wrap panel has 19 dual rows of 47 pads each, providing the equivalent capacity of 95 16-pin sockets. Plated-thru holes, gold finger tabs on FR-4 glass epoxy.

Same as 32-DE-16, but with 95 16-pin wire-wrap sockets installed. Pins extend .600" on the wiring side; sockets and pins on component side extend .300" above board surface.

Will hold up to 5 rows of IC's; each dual row contains 109 pads spaced on .100" intervals. .900" width of each row allows mounting of virtually any size IC as well as access to each pin. Vcc and GND fully distributed around board.

Same as 12-DE-16, but with .300" wire-wrap pins mounted in the outermost holes in each dual row of pads, as well as in the holes feeding the fingers. Boards designed to nest with adequate clearance on .500" motherboard centers.

Multimodule, compatible with iSBX system of on-board expansion for SBC boards. Mounting holes align with those on SBC host board. General purpose breadboarding areas as well as additional I/O pads at edge of board.

Multimodule, same as above except in larger size. Power and ground traces on each board run directly to the iSBX connector pins. (iSBX connector not included.)

Wire-wrap pins installed for all I/O fingers and for power distribution.

continued next page

## Prototyping Boards

Manufacturer	Model	Price	DFA	Deliv.	No. Columns	16-Pin DIP Capacity	Edge Connector (No./Pins)
Electronic Solutions ..... (619) 242-0292	PR 80H	\$85	-	stk	-	90	2/25
	PR 80A	\$355	1/82	stk	-	38	3/25
ETI Micro ..... (415) 829-6600	8152	\$50	3/81	stk	-	114	dual row header
Garry .....	EP146	\$335	-	stk	-	-	-
General Digital ..... (203) 528-9041	GDX- PROTO-1	\$60	12/81	stk	-	-	72-pin I/O
Hybricon ..... (617) 486-3174	2-8010A-T	\$108	6/78	stk	62	138	2/50,1/40
	2-8010B-T	\$127	6/78	stk	62	138	edge conn. fingers
	4-8010A-VHF	\$335	9/80	2wk	62	138	2/50,1/40
	4-8010B-VHF	\$344	9/80	2wk	62	138	edge conn. fingers
	4-8010C-VHF	\$405	*3/83	2wk	70	168	2/50,1/40
	4-8010D-VHF	Con. Factory	*5/83	Con. Factory	62	310	2/50,1/40
Intel Corporation ..... See Sales Office Listing	iSBC 905	\$130	-	-	-	96	1/100
Logitech, Inc. .... (415) 326-3885	PY9000-XPB	\$99	7/82	-	-	144	2/50,1/25
Matrox Electronic ..... (514) 735-1182	PTB-1	\$115	-	-	-	120	-
MDB Systems .....	MNTL-GP-16	\$295	-	-	-	48	3/50
	MNTL-WWB	\$145	-	-	12	60	WW pins



### Distinguishing Features

Provision for mounting -5V regulator and decoupling +5V input; optional double height board \$185.

Interface/prototyping board; 20-bit address decoding, 8-16-bit data bus; interfaces to 8 peripheral devices; XACK & AACK; optional double height board \$455.

Room for 38 bypass capacitors for the +5V supply.

Several configurations available.

Prototyping expansion module; replaces National BLX-391; accepts 40+60 Pin ICs. 72-pin right angle I/O connector power and SIP areas, layout guide provided.

Plated through holes for installation of all DIP sizes, spacing on .3", .4", .5", .6" and .9" centers. Quantity of power voltages - five.

Has 62 columns with 52 holes per column. Vcc, Gnd and I/O pins installed. Reproducible documentation for ease in configuration control.

Exclusive VHF configuration is suitable for high speed analog, ECL, Schottky, T<sup>2</sup>L and general logic applications. 52 of 62 columns pinned with socket pins.

Provides lowest noise of all competitive configurations. Negligible series inductance in bypass path with individual device bypassing. Custom pinning process available, Socket-Sert<sup>R</sup>.

Highest density available on Multibus compatible wire-wrap board. Continuous ground plane acts like third layer. 70 of 70 columns pinned with socket pins.

Double height multilayer board custom pinned with Socket-Sert<sup>R</sup> or 4-format. 19" Rack Backplane/Card Frame Assembly provides long side plates, board handler extractor unique.

continued next page

## Prototyping Boards

Manufacturer	Model	Price	DFA	Deliv.	No. Columns	16-Pin DIP Capacity	Edge Connector (No./Pins)
Metacomp, Inc. .... (619) 571-1168	MPA-1000	\$2395	9/82	30da	-	-	-
Methode Electronics .....	300-1000-XXX	\$530	-	-	45	108	1/86,1/60
	Series 2200	\$-	1/83	-	28	48	1/86,1/60
Monolithic Systems .....	MSC 8204-01	\$225	-	-	-	84	2/50,1/26
Mupac Corporation .....	315 series	\$459	8/80	stk	54	150	triple row header
National Semiconductor .....	BLC-905	\$105	-	stk	-	108	1/100
See Sales Office Listing	BLC-8905	\$99	-	stk	-	108	2/50,1/26
	BLX-391	\$100	-	stk	-	14	-
Prototek .....	WWA-126	\$125	3/79	stk	-	-	1/100
(513) 874-5094	WWB-126	\$115	3/79	stk	-	-	dual row header
Scanbe, Div. of Zero .....	12120	\$260	10/81	stk	-	108	2/50,1/24
(213) 579-2300	12196						
Schneider Instrument .....	MB 80	\$165	6/79	stk	18	66	1/50,1/26
Vector Electronics .....	4608	\$59	80	stk	-	54	-
(213) 365-9661	4608-1	\$43.62	80	stk	-	144	-
Vero Electronics .....	06-2987E	\$59	-	-	-	84	-
Zendex .....	ZX-905	\$98	1/80	stk	-	84	2/50,1/26
(415) 828-3000	ZBX-391	\$98	1/82	stk	-	10	-

#### Distinguishing Features

MetaPaket architecture. Foundation and 8086, 8089 IOP, 80130 OSF, 8254's 8259A PIC, 128K RAM with parity, 64K dual ported, 64 EPROM, multimaster interface, large wire-wrap area, 2 iSBX sites, 2 50-pin edge connectors, 12" x 12" form factor.

3 50-pin wire-wrap headers; optional 2 50-pin, 1 26-pin edge connectors.

Includes 68-pin JEDEC type "A" leadless chip carrier socket with wrappable pin-out.

Full Multibus interface and bus arbitration logic on-board.

3 level gold/gold, optional 2 level gold/gold, 3 level tin/gold. Panel will handle most devices currently available.

Alternate source to iSBC 905, capacity for 108 16-pin DIPs.

SBX MULTIMODULE configuration for prototyping, accommodates 40-pin ICs.

Universal prototype boards with 3 level wire-wrap pins on voltage ground and I/O signal interconnections; allows usage of 14 through 64-pin IC sockets.

Same as WWA-126 except dual row header.

2 level and 3 level wire-wrap pins, extensive ground plane, universal pattern .100 x .300.

Contains complete Multibus "General Purpose Slave Interface," per Intel application note AP-28.

Pre-wired for regulator; dual bus under DIPs for power & ground. Extra I/O connectors. Overall grid of .042" dia. holes on 0.1" centers.

Board with overall grid of .042" dia. holes and gold plated etched contacts only for freedom of component placement.

SBX MULTIMODULE

## Extender Cards

---

Advanced Micro Devices  
Central Data Corporation  
Comark Corporation  
Douglas Electronics, Inc.  
Electronic Solutions  
ETI Micro  
Hybricon Corp.  
Intel Corporation  
Matrox Electronic Systems  
MDB Systems  
Mupac Corporation  
Monolithic Systems Corp.  
National Semiconductor Corp.  
Prototek, Inc.  
Scanbe, Div. of Zero  
Vector Electronic Company



## Extender Cards

Manufacturer	Model	Price	DFA	Deliv.	Distinguishing Features
AMD ..... (408)988-7777	AM95/6420	\$160	-	stk	Extender Board.
Central Data ..... (217)359-8010	B1010	\$95	-	stk	Raises board under test 6.9".
Comark Corporation ..... (617)894-7000	MB-EXT	\$75	-	-	
Douglas Electronics, Inc. ....	6-DE-16-C	\$50	1/81	stk	Universal Multibus extender; FR-4 glass epoxy with gold fingers; all connector contact surfaces are also gold plated.
Electronic Solutions ..... (714)292-0242	80EX-2	\$85	-	stk	
	2X80EX-2	\$155	-	stk	Double height extender card.
ETI Micro ..... (415)829-6000	8151	\$105	-	stk	Power switches on-board; ground isolation between traces; gold plated connections; support brackets.
Hybricon ..... (617)486-3174	8010ET	\$154	6/80	stk	Gold plated; double loop test points, connectors included. Optional version with card hold-down braces.
Intel Corporation ..... See Sales Office Listing	MDS-610	\$150	-	-	
Matrox Electronic ..... (514)735-1182	BEX-1	\$130	-	-	8" high; numbered pins.
MDB Systems ..... 	MNTL-XBD	\$150	-	-	
Mupac Corporation ..... (617)588-6110	3153080-01	\$89	-	stk	
Monolithic Systems ..... (303)770-7400	MSC 8203-01	\$160	-	-	
National Semiconductor ..... See Sales Office Listing	BLC-610	\$119	-	stk	Alternate source for MDS-610.
	BLC-8610	\$155	-	-	With power isolation.
Prototek Inc. .... (513)874-5094	ECA-126	\$85	3/79	stk	Standard and railed extender cards, railed cards give maximum support to extended boards and have solid ground plane on backside of PC board.
	ECA-126R	\$150	2/81	stk	
Scanbe, Div. of Zero ..... (213)579-2300	12123	\$110	2/82	stk	
Vector Electronic Company ..... (213)365-9661	3690-18	\$42.50	82	stk	43/43 & 30/30 connectors installed, gold plated contacts Labelled test points.

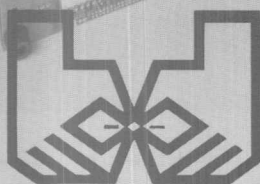
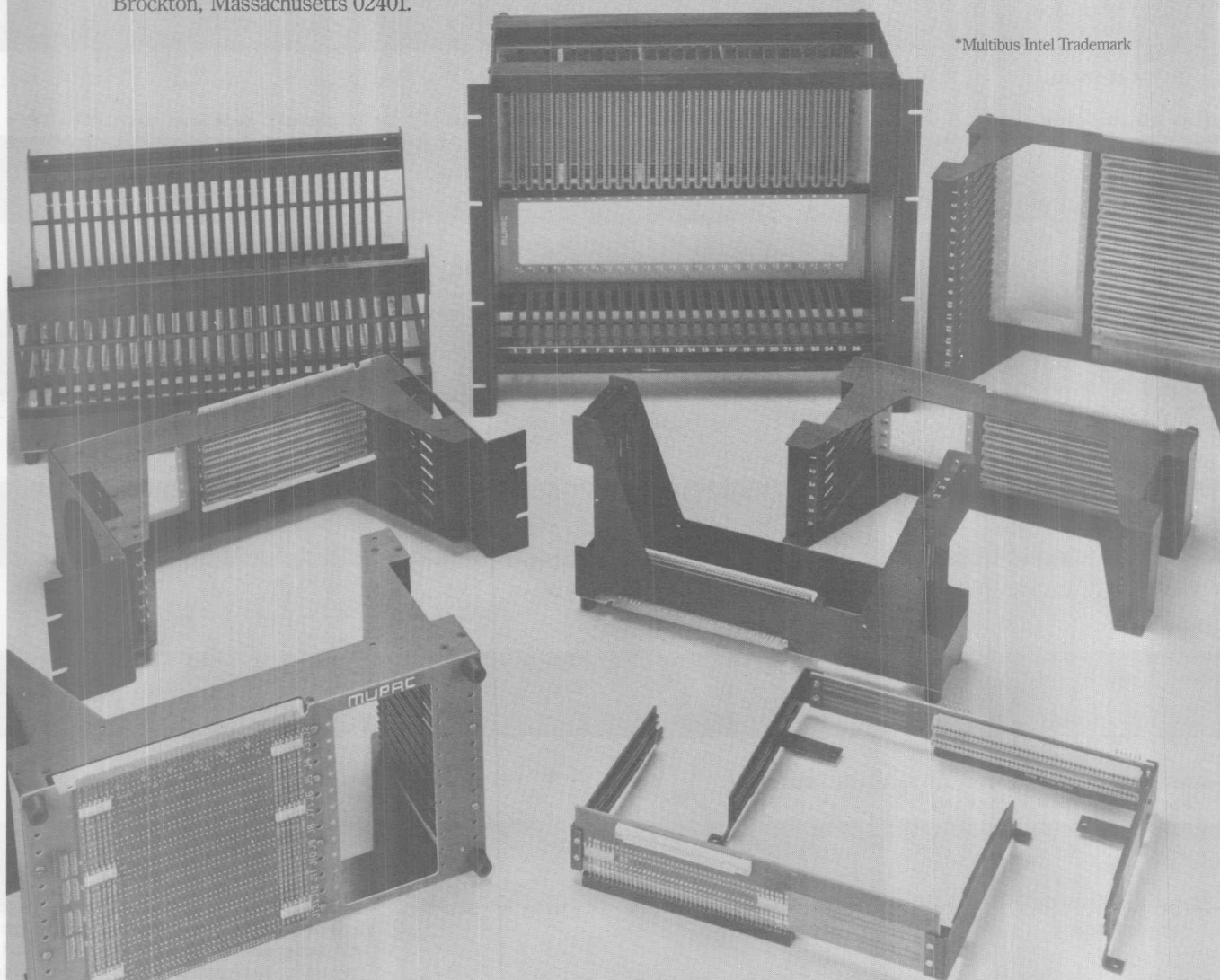
# MULTIBUS\*

## EVERYTHING YOU NEED FOR MULTIBUS COMPATIBLE PACKAGING IN ONE RELIABLE PRODUCT FAMILY

Mupac's family of Multibus compatible card racks offers you the most flexible, compact and reliable Multibus packaging system available today. Card racks and expanders provide 19 different configurations for 2 to 26 active boards. Other parts of the system include wire wrap panels for prototyping and interface applications plus I/O panels for bus extension.

We'll be happy to send you complete details along with our latest catalog. Please write or call toll free 800-225-0398. (In Massachusetts 588-6110.) TWX (710) 345 8458. Mupac Corporation, 10 Mupac Drive, Brockton, Massachusetts 02401.

\*Multibus Intel Trademark



# MUPAC®

A SYSTEMS APPROACH TO PACKAGING YOUR SYSTEMS

Mupac Corporation, 10 Mupac Drive, Brockton, Massachusetts 02401

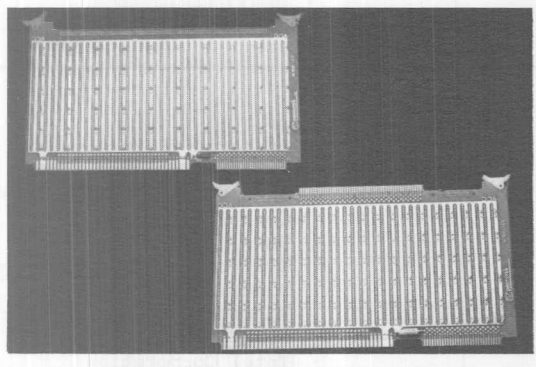
## Card Cages

Advanced Micro Devices  
Anitech Systems, Inc.  
Chen Digital Laboratories  
Comark Corporation  
Dawn Technology, Inc.  
Electronic Control Technology  
Electronic Solutions  
Electro-Space Fabricators  
Hybricon Corp.  
Intel Corporation  
Matrox Electronic Systems  
Mupac Corporation  
Monolithic Systems Corp.  
National Semiconductor Corp.  
NEC Electronics U.S.A.  
Optima, Scientific Atlanta  
Prototek, Inc.  
Scanbe, Div. of Zero  
Sibthorp Systems, Inc.  
Unitrack  
Vector Electronic Company  
Zendex Corporation

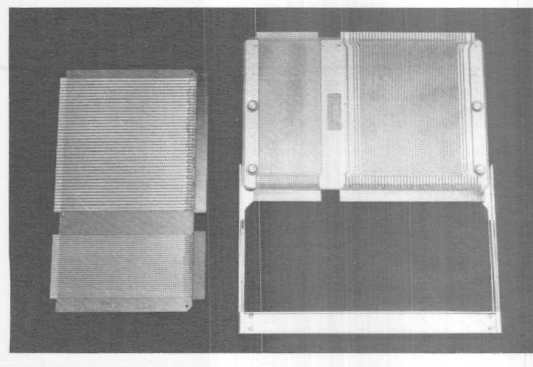


# PROTOTEK<sup>INC</sup>

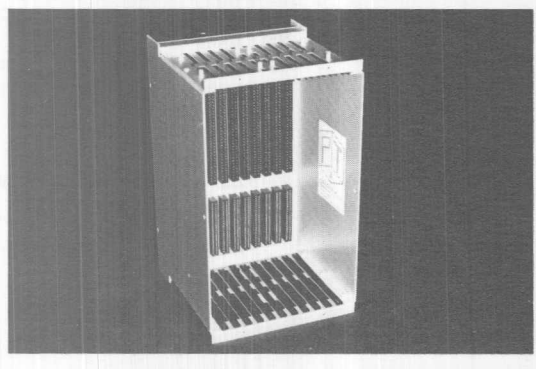
**CAN support your Multibus Developments  
from Prototype through Production**



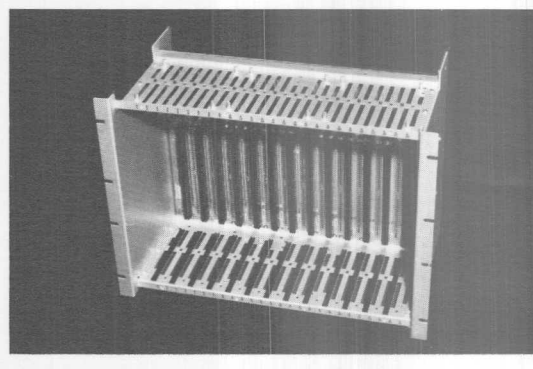
Wire Wrap Cards



Extender Cards

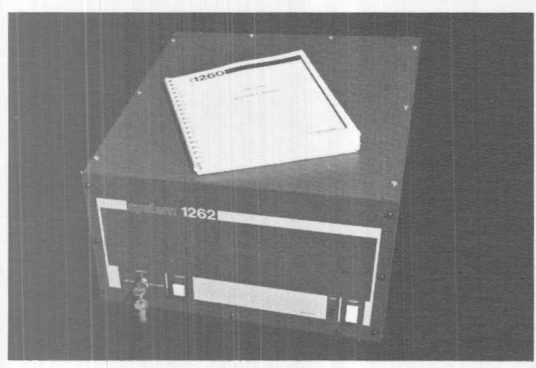


11 Slot Card Cage



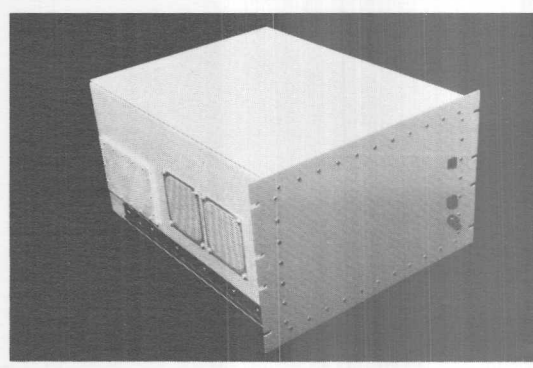
26 Slot Card Cage

- Available with 5, 7, 9, 11, 14, 18, and 26 Positions



Industrial  
Power Ready Chassis

- Meets FCC Class A EMI Requirements



Military EMI/RFI  
Power Ready Chassis

- Meets MIL STD 461 EMI Requirements

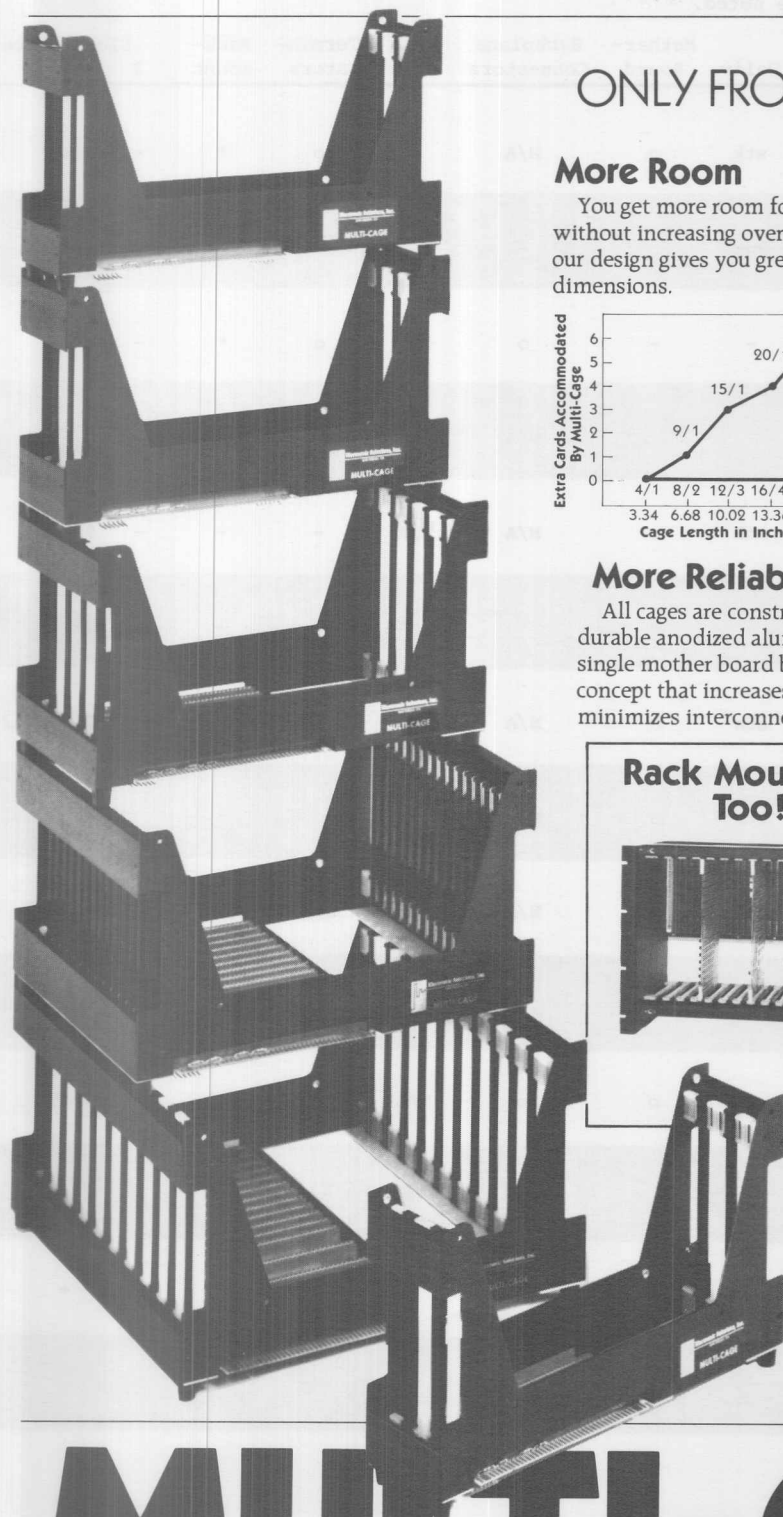
**Call and discuss your requirements with us**



P.O. Box 46512 • Cincinnati, Ohio 45246 • Phone (513) 874-5094



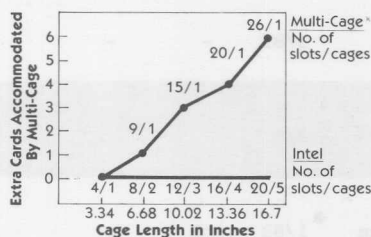
# More Room... More Multibus® Cages.



ONLY FROM ELECTRONIC SOLUTIONS!

## More Room

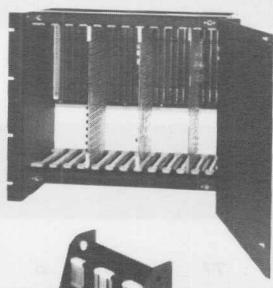
You get more room for extra cards without increasing overall size, because our design gives you greater inside dimensions.



## More Reliability

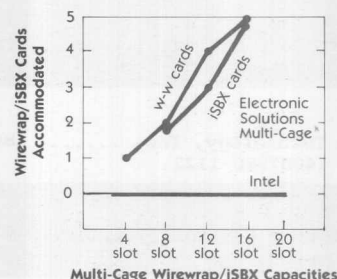
All cages are constructed of sturdy, durable anodized aluminum with a single mother board backplane... a concept that increases reliability and minimizes interconnections.

## Rack Mounting Too!



## More Models

We have more models than all our competitors combined. Choose a cage with 3, 4, 5, 6, 7, 8, 9, 12, 14, 15, 16, 20, 24 or 26 slots for the right solution to your problem. We have models with either 0.6" or 0.75" card centers and can even accommodate wirewrap cards.



All models are electrically and dimensionally interchangeable with Intel's iSBC-80® Cages.

## More Warranty

A three year warranty is your assurance of quality.

## More Information?

Call our toll free number  
(800) 854-7086  
In Canada Call:  
Transduction Ltd.  
(416) 625-1907



**Electronic Solutions**

5780 Chesapeake Ct., San Diego, CA 92123  
(619) 292-0242  
Telex II (TWX): 910-335-1169

Note: Multi-Cage is a registered trademark of Electronic Solutions  
Multibus, Intel and iSBC-80 are trademarks of Intel.

# MULTI-CAGE®

## Card Cages

Note: Slots on 0.6" centers unless otherwise noted.

Manufacturer	Model	DFA	Deliv.	Mother- Board	Backplane Connectors	No. Fans	Termin- ators	Rack- mount	Slots/Price		
									3	4	5
AMD .....	95/6440 (408)988-7777	-	stk	o	N/A	*	o	*	-	+	-
Anitech Systems Inc. ....	R2175 .75" ctr	3/82	2wk	o	-	-	-	-	-	+	-
Chen Digital Laboratories ...	CCE-6B .75" ctr	3/82	-	-	o	*	o	*	-	+	-
Comark Corporation .....	CARDPAC-M (617)894-7000	*10/82	-	o	N/A	2,4,6	o	o	-	+	-
Dawn Technology, Inc. ....	Backplane (408)980-1122	*1/83	stk	o	N/A	N/A	-	-	-	\$110	-
Electronic Control .....	M-CC-6 Technology	-	-	o	-	N/A	-	-	-	-	-
Electronic Solutions .....	ES-SBC (619)292-0242	6/78	stk	o	N/A	*	o	*	-	\$180	\$245
	SBC-753 .75" ctr	6/80	stk	o	N/A	*	o	*	\$190	\$235	\$270
Electro-Space Fabricators ...	ESF 80 (215)682-7181	-	stk	N/A	N/A	-	N/A	*	-	\$35	-
Hybricon .....	HBFA-6XX (617)486-3174	8/82	stk	o	o	*	o	o	\$160	\$168	\$206
Intel Corporation .....	iSBC 604 See Sales Office Listing	77	stk	o	o	N/A	o	N/A	-	\$180	-
	iSBC 608	3/82	stk	o	o	Fan Mtg.	o	o	-	+	-
Matrox Electronic .....	CCB7S (514)735-1182	-	-	o	N/A	1	o	-	-	+	-

Slots/Price			Slots/Price			Slots/Price			Slots/Price					
6	7	8	9	10	11	12	14	15	16	18	20	21	24	26
\$360	-	-	-	-	-	-	+	-	-	*	-	+	-	-
Can be expanded by use of edge connectors; 18 slots available with 8 slots available for parallel DMA. Optional 6-slot card cage with power supply \$1060.														
-	-	-	-	-	-	-	+	-	-	-	-	\$900	-	-
16-channel PPR, optional wall mount.														
\$249	-	-	-	-	-	\$575	+	-	-	\$936	-	+	-	-
-	-	\$395	-	-	-	-	+	-	\$795	\$895	-	+	\$1195	
Optional front panel.														
\$140	-	\$165	\$175	-	-	\$215	+	-	-	-	\$320	+	-	\$385
Fully shielded backplanes to minimize EMI and RFI emissions; optional PPR.														
\$255	-	-	-	\$295										
\$295	-	\$365	\$490	-	-	\$595	\$745	\$795	\$845	-	\$1045	+	\$1245	\$1345
Optional parallel priority resolution circuitry; horizontal and vertical rackmount.														
-	\$380	-	-	-	-	\$705	+	-	\$925	-	-	\$1200	-	-
\$193	-	\$205	-	\$220	-	\$232	\$245	-	\$255	\$272	\$284	+	\$309	-
Custom Multibus enclosure, contact the factory														
\$233	\$222	\$230	\$242	\$465	\$474	\$484	\$504	\$514	\$524	\$544	\$737	\$752	\$797	\$827
1/16" thick double sided board (Optional 1/8" 4-layer), full ground plane, P1 connector installed. Options: PPR accessory bd. P2 auxilliary board, Fan assemblies, holddown brackets.														
-	-	\$360	-	-	-	\$540	+	-	-	-	-	+	-	-
-	-	\$390	-	-	-	-	+	-	\$780	-	-	+	-	-
Note: Eight-slot card cage and backplane with built-in parallel-priority arbitration circuitry. All eight slots accomodate iSBC MULTIMODULE boards. Two slots accomodate iSBX MULTIMODULE boards.														
-	\$680	+	-	-	-	-	\$1360	-	-	-	-	\$2140	-	-

continued next page

## Card Cages

Note: Slots on 0.6" centers unless otherwise noted.

Manufacturer	Model	DFA	Deliv.	Mother- Board	Backplane Connectors	No. Fans	Termin- ators	Rack- mount	Slots/Price		
									3	4	5
Monolithic Systems ..... (303) 770-7400	MSC 8201	-	-	o	N/A	1	o	o	-	+	-
Mupac Corporation ..... (617) 588-6110	305XXXX-01	7/81	stk	o	N/A	-	o	*	-	\$186	-
	Vertical Style	3/82	-	o	N/A	-	o	o	-	+	-
National Semiconductor ..... See Sales Office Listing	BLC-604	-	stk	o	N/A	-	o	-	-	\$190	-
NEC Electronics ..... (617) 655-8833	AP0900	12/81	stk	o	N/A	-	o	-	-	\$235	-
Optima, Scientific Atlanta ..	Instrumate	12/81	-	-	N/A	-	-	o	-	+	-
Prototek, Inc. .... (513) 874-5094	CWF-126P	3/79	stk	-	o	-	-	o	-	+	\$325
Scanbe ..... (213) 579-2300	30660	1/79	stk 4wk	o	o	o	o	o	-	\$175	-
Sibthorp Systems ..... (606) 525-1300	MCC-106	3/81	stk	o	N/A	-	o	-	-	+	-
Unitrack ..... (606) 525-1300	M80	-	-	-	o	-	-	-	-	\$49	-
Vector Electronic ..... (213) 365-9661	CCK-80	80	stk	-	N/A	-	-	o	-	+	-
Zendex ..... (415) 828-3000	ZX-609C	7/81	stk	o	N/A	2*	o	-	-	+	-



Slots/Price			Slots/Price			Slots/Price			Slots/Price			Slots/Price		
6	7	8	9	10	11	12	14	15	16	18	20	21	24	26
-	\$620	+	-	-	-	-	+	-	-	-	-	+	-	-
\$250	-	+	\$326	-	-	\$411	+	\$474	(2-slot cage available \$99)			-	\$708	
Note: Optional PPR, -5V reg., vertical and horizontal mounting.														
-	-	+	-	-	-	-	+	\$560	-	-	-	+	-	\$745
-	-	\$380	-	-	-	\$570	-	o	o	o	o	-	o	o
\$350	-	\$450	\$495	-	Contact the factory for larger models, horizontal or vertical.									
-	-	+	-	-	-	-	+	-	-	-	-	+	-	-
-	\$390	+	-	-	\$445	-	+	-	-	\$810	-	+	-	\$1235
Bussed or wire-wrappable 1/8" backplane, punched fan mount support rails and flat or RM end panels, includes P2 connectors. Optionally available in kit form.														
\$220	-	\$255	\$265	-	-	\$315	+	-	\$410	-	\$485	+	-	\$570
Optional: W/W connectors, foot kit, doors, fan mtg. brkts, vertical and horizontal racks, and parallel-priority resolution circuitry. Contact factory on any custom application - new designs or modifications from standard models and units with .750 ctrs. Units with & without backplanes.														
\$350	-	\$365	-	-	-	\$625	+	-	-	-	-	+	-	-
Light weight aluminum, optional P connectors, smooth easy insertion nylon guides, termination networks.														
\$62	-	+	-	-	-	-	+	-	-	-	-	+	-	-
-	-	+	-	\$89.55	-	-	+	-	-	-	-	+	-	-
-	-	-	\$650	-	-	-	+	-	-	-	-	+	-	-
Parallel priority resolution network for Multimaster systems. Optional 2-slot horizontal motherboard requires +5V only \$295.														

## Power Supplies

---

Electronic Solutions  
EMM/Sesco  
Intel Corporation  
Monolithic Systems Corp.  
National Semiconductor Corp.  
NEC Electronics U.S.A.  
Zendex Corporation

## Power Supplies

Manufacturer	Model	Price	DFA	Deliv.	Outputs (A)					Distinguishing Features
					+5	-5	+12	-12	+24	
Electronic Solutions ..... (619) 292-0242	MP-514	\$450	-	stk	14	.9	2	.9	-	Overvoltage protection, remote sensing for +5V; Optional RM.
	MP-530	\$625	-	stk	30	1.75	4.5	1.75	-	Optional RM.
EMM/Sesco .....	SECS 80/PS 115	\$4200	-	-	25	.9	2	.8	-	MIL-Spec.
	SECS 80/PS 28	\$3500	-	-	14	.9	2	.8	-	MIL-Spec.
Intel Corporation ..... See Sales Office Listing	iSBC 635	\$610	-	-	14	.9	2	.8	-	
	iSBC 640	\$825	-	-	30	1.75	4.5	1.75	-	
	iSBC 645	\$1120	-	-	15	1	3	1	-	
Monolithic Systems ..... (303) 770-7400	MSC 8202	\$550	-	-	18	1.2	2.4	1	-	
National Semiconductor .... See Sales Office Listing	BLC-635	\$554	-	stk	14	.9	2	.8	-	Alternate source for iSBC 635.
	BLC-665	\$825	-	stk	30	1.75	4.5	1.75	-	
NEC Electronics ..... (617) 655-8833	APO950-030	\$495	12/81	stk	14	.9	2	.8	-	
	APO950-031	\$695	12/81	stk	30	1.75	4.5	1.75	-	
Zendex ..... (415) 828-3000	ZX-635	\$525	1/80	stk	14	.9	2	.8	-	Replaces SBC 635.
	ZX-640	\$725	1/80	stk	30	1.75	4.5	1.75	-	Replaces SBC 640.

# NEED A BETTER MULTIBUS CAGE?



## SCANBE CAN BE...YOUR ANSWER

The answer is as close as your telephone. Scanbe's low noise, high quality Micro-File™ accepts all Multibus™ cards and is immediately available in 4, 6, 8, 9, 12, 16, 20 and 26-slot versions. These models come with or without backplanes and feature • rugged, anodized aluminum construction • Deep-Trak™ nylon guides • local distributor stock • custom applications. Call today for more information and a free Design Guide.

**Scanbe**, Division of Zero Corporation, 3445 Fletcher Ave., P.O. Box 4159, El Monte, CA 91731, Phone: **(213) 579-2300**, TWX: (910) 587-3437.



*The Packaging People*



## Chassis

Advanced Micro Devices  
AESI Division  
Anitech Systems, Inc.  
Central Data Corporation  
Comark Corporation  
Cosmos Systems, Inc.  
Distributed Computer Systems  
Electronic Control Technology  
Electronic Solutions  
ETI Micro  
Forward Technology, Inc.  
Heurikon Corporation  
Intel Corporation  
Mesa Technology Corp.  
Monolithic Systems Corp.  
National Semiconductor Corp.  
NEC Electronics U.S.A.  
Panlmatic Company  
Prototek, Inc.  
Sibthorp Systems, Inc.  
Thomas Engineering Co.  
TITN, Inc.  
Zendex Corporation

# INDUSTRIAL TOUGH AND AFFORDABLE

## THREE MULTIBUS™ CHASSIS FROM ETI MICRO

The ETI Multibus Chassis is not just another pretty face. Behind the attractive, removeable front bezel you'll find a rugged, sophisticated package.

The ETI chassis family includes a 9-slot and 15-slot multibus chassis, as well as a dual 8" diskette chassis.

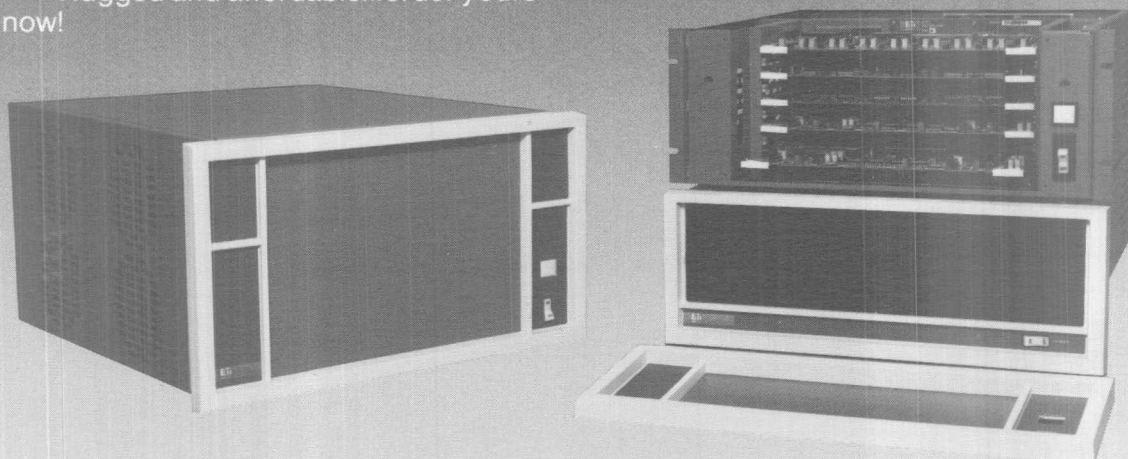
Welded steel construction provides an efficient EMI shield for the electronics. The use of welded seams, instead of screw mounting, assures a rugged, stress-resistant enclosure.

The multibus chassis comes completely integrated with card cage, power supplies, fans, EMI line filter, reset button and on/off circuit breaker.

For multibus systems designed to function in even the toughest environments, you can't afford to put it in a flimsy bolted or aluminum chassis. Choose the model that fits your needs.

Rugged and affordable...order yours now!

Quantity: 1		
8100	9-slot multi-bus chassis	\$1250
8215	15-slot multi-bus chassis (supports parallel or serial bus priority)	\$1700
8300	Dual 8" diskette chassis (includes two disk drives)	\$2510



MULTIBUS is a trademark of Intel Corporation

**ETI**  
MICRO

ETI MICRO, 6918 SIERRA COURT, DUBLIN, CA 94568, (415) 829-6600

Finally there's a system chassis that is designed and manufactured with the thoroughness and care you expect in your Multibus system. It's Electronic Solutions' new Multichassis™.

- 9 slots, 0.6" spacing—or 7 slots, 0.75" spacing
- Hefty 4-output 300W power supply—40A at +5V
- Cool operation even with high-density boards

There's a field-proven card cage and backplane, plus full RFI filtering, locking front panel function switch, power fail detection, and quiet dual cooling fans with quick-change filters.

And best of all, the removable front panel lets you easily customize the Multichassis to match your company color and logo.

So treat your Multibus system to an elegant but affordable new home—the Multichassis by Electronic Solutions. Call us today for full specifications and prices.

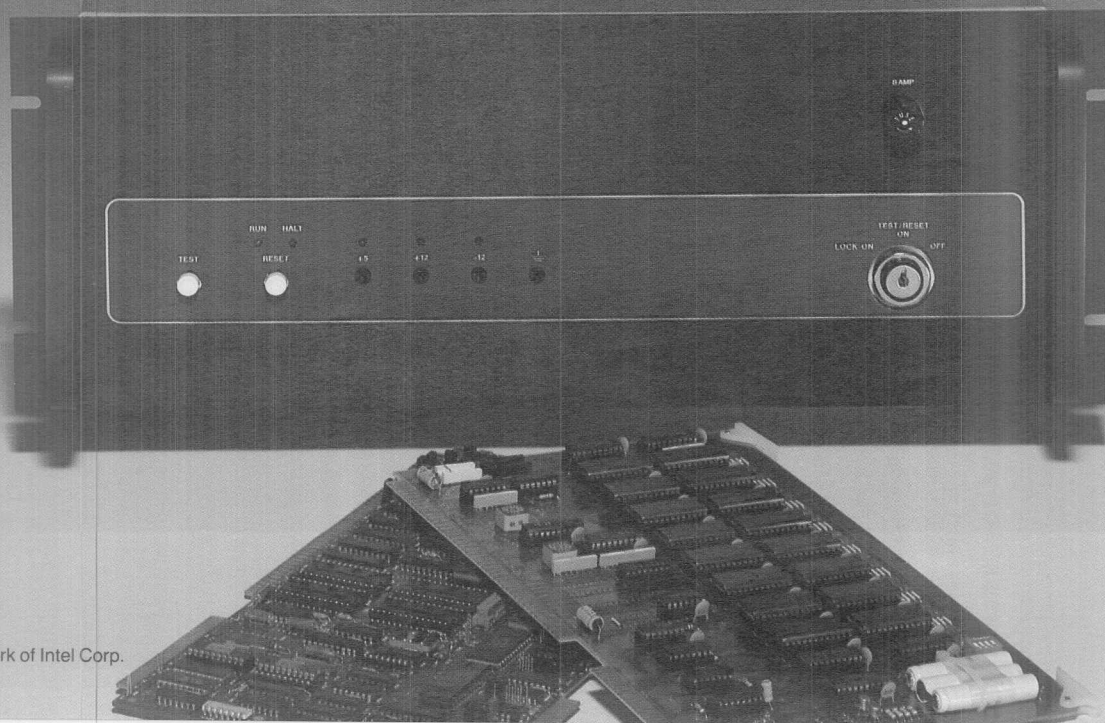


## Electronic Solutions

5780 Chesapeake Ct.,  
San Diego, CA 92123  
Call toll free (800) 854-7086  
in California (714)\* 292-0242

\*(after 11-6-82 use area code 619)

# Home Sweet Home for Your Multibus\*



\*Multibus is a trademark of Intel Corp.



## Chassis

Manufacturer	Model	Price	DFA	Deliv.	Capacity (Slots)	Reset SW	P/S Output +5 -5 +12 -12 +24	Fan(s)
AMD ..... (408) 988-7777	Am95/6450	\$1725	-	stk	6 14*	o	o o o o o	N/A 2
	Am95/6454	\$3850	-	stk	N/A	o	o - o - o	1
AESi Division ..... (213) 443-9381	-	\$2195	9/82	-	12	-	10 20* - 2.5 1.5	2 3
Anitech Systems Inc. ...	R1575C	\$1695	*2/83	4wk	15	-	20 1 4 4 -	-
Central Data ..... (217) 359-8010	C1000	\$2240	3/80	stk	15	o	40 - 3.4 3.4	N/A 1
	C2000	\$1995	*5/83	30da	15	o	40 - 6 6	N/A 4
Comark Corporation .... (617) 894-7000	DISKSTOR M	\$1695	9/81	-	8 16*	o	25 1.5 4 4 4	3
	PC80A	\$1195	10/79	-	9	o	25 1 4 4 4	2
	CARDPAC MP	\$1095	*10/82	-	8	o	25 1.5 4 4 4	2
	PC280	\$2495	7/80	-	18	o	50 2 8 3.7	N/A 2
Cosmos Systems, Inc. ...	CMT-CHA	\$3400	1/82	-	9	o	15 .5 3.4 2.5	N/A 1
Distributed Computer .. (617) 899-6619 (800) 225-4589	ICM/80	\$1400	-	-	9 9*	o	25 2 2 2	N/A 1
	DCS/80-BFP	\$1500	-	-	9	-	o o o o	N/A -
Electronic Control .... Technology	-	\$1795	82	-	10	o	- - - -	3
Electronic Solutions .. (619) 292-0242	MC-609	\$1150	6/82	stk	9	o	40 .15 3 2.8	N/A 2
	MC-610	\$995	*5/83	stk	10	o	30 - 3 3	N/A 2
	MC-757	\$1150	8/82	stk	7	o	40 .15 3 2.8	N/A 2
	MC-6015	\$1950	*5/83	stk	15	o	40 .15 3 2.4	N/A 2



Dimensions (in.)			Rackmount	Slides	Distinguishing Features
Height	Width	Depth			
5.25	19	19.25	o	o	Optional 14-slot chassis \$2825, includes 40 amp power supply.
5.25	19	22	o	o	8" Floppy Drive Chassis, houses two horizontally.
10.5	19	24	*	*	Power supply includes -24V, 2A.
-	-	-	-	-	
10.5	16.75	22.75	*	*	
10.25	16.25	23.0	*	*	Built-in area for 5 $\frac{1}{4}$ " Winchester and/or 5 $\frac{1}{4}$ " removable Winchester.
10.5	19	19	o	-	8" Floppy Drive Chassis, control panel w/keylock.
5 $\frac{1}{4}$	19	14.5	o	*	
5 $\frac{1}{4}$	19	14.5	o	-	Available in 16 and 24 slots w/400, 600W power supply, optional front panel, reset sw, status lamps standard.
21	19	14.5	o	*	Optional 8-slots wired to MC P2 for parallel DMA bus arbitration.
7	19	25	*	-	
17	19	12	o	-	Optional additional 9-slot card cage for 18 total slots.
-	-	-	o	-	Has blank front panel.
9.5	16	19	*	-	Switching power supply.
7	19	17.5	o	-	Full featured control panel; power fail detection; .6" card centers. Optional custom labeled panel.
7	19	17.5	o	o	Front loading, 3 output switching power supply.
7	19	17.5	o	-	Same as 609 excpet .75" card centers.
10.5	19	22	o	o	

continued next page

## Chassis

Manufacturer	Model	Price	DFA	Deliv.	Capacity (Slots)	Reset SW	P/S Output +5	-5	+12	-12	+24	Fan(s)
ETI Micro ..... (415) 829-6600	8100	\$1250	3/81	stk	9	o	30	1.75	4.5	1.75	N/A	2
	8300	\$945	3/81	stk	N/A	o	-	-	-	-	o	1
	8215	\$1700	9/82	stk	15	o	30	1.75	4.5	1.75	N/A	2
	8223	\$-	*83	stk	23	-	50	-	3.4	3.4	N/A	o
Forward Technology ....	FT-CHP	\$1295	-	-	6	o	20	-	-	-	N/A	-
Heurikon Corporation .. (608) 271-8700	MLZ-804	\$1495	-	-	4	o	o	o	o	o	N/A	1
	MLZ-806	\$1695	*83	-	6	o	o	o	o	o	N/A	1
	MLZ-814	\$2500	-	-	14	o	o	o	o	o	N/A	1
	MLZ-FOX	\$865	-	-	N/A	-	-	-	-	-	o	1
Intel Corporation ..... See Sales Office Listing	iCS 80/ Kit 640	\$2235	79	stk	4 12*	o	30	1.75	4.5	1.75	N/A	3
	iSBC 680	\$2990	1/82	stk	6	o	30	2	2.9	3	-	3
	iSBC 655	\$1695	78	stk	4	o	14	.9	2	.8	N/A	2
	iSBC 665	\$1625	80	stk	4	o	15	1	3	1	N/A	1
	iSBC 660	\$1995	70	stk	8	o	30	1.75	4.5	1.75	N/A	2
	iSBC 661-1	\$1995	*1/83	stk	8	o	30	1.75	4.5	1.75	N/A	2
	iSBC 661-2	\$ -	*6/83	stk	8	o	45	-	4.6	6.6	N/A	2
	iCS 80/ Kit 635	\$2043	79	stk	4 12*	o	14	.9	2	.8	N/A	3

Dimensions (in.)			Rackmount	Slides	Distinguishing Features
Height	Width	Depth			
6.9	19	20	o	*	Includes EMI filter, switched duplex outlet, has optional P2 backplane; can accommodate ballbearing slides.
-	-	-	o	-	Diskette Chassis, 90W power supply.
10.4	19	20	o	*	Same features as 8100; Accommodates parallel bus priority.
15.7	19	20	o	*	Includes card cage, power supplies, fans EMI filter, optional P2 backplane, supports parallel bus priority.
-	-	-	-	-	Table-top enclosure.
-	-	-	o	-	Optional desk-top version \$1545.
-	-	-	o	-	Optional desk-top version \$1745.
-	-	-	o	-	Optional desk-top version \$2550.
-	-	-	o	-	8" Floppy Drive Chassis, houses two; desk-top version \$915.
17.4	19	11.5	o	N/A	Rackmount industrial chassis with front access to Multibus boards. Compatible with iSBC 910/920/930 signal termination strips. Expandable to 12-slots, remote sensing for +5V.
12.2	16.8	21.5	o	*	Rackmount or table-top chassis with 300W switching power supply. Powers and houses two standard 8" peripherals. Certified by UL/CSA/FCC for class A data processing equipment.
-	-	-	o	o	Rackmount four-slot chassis with attractive injection molded front front panel.
3.5	19	16.25	o	N/A	Rackmount four-slot chassis with switching power supply. On-board real-time clock.
7	17	20	o	o	Rackmount eight-slot chassis with attractive injection molded front panel.
8.75	16.95	19	o tbltop*	*	Rackmount or table-top chassis configurable for either front or rear access to Multibus boards. Input voltage selectable from 100/120/220/240 VAC +10%. Certified UL/CSA/FCC for Class A.
8.75	16.95	19	o tbltop*	*	Same as iSBC 661-1 except this chassis uses a 325W switching power supply. Power-fail warning with 8 msec hold-up time.
17.4	19	11.5	o	N/A	Rackmount industrial chassis with front access to Multibus boards. Compatible with iSBC 910/920/930 signal termination strips. Expandable to 12 slots, remote sensing for +5V, power fail warning.

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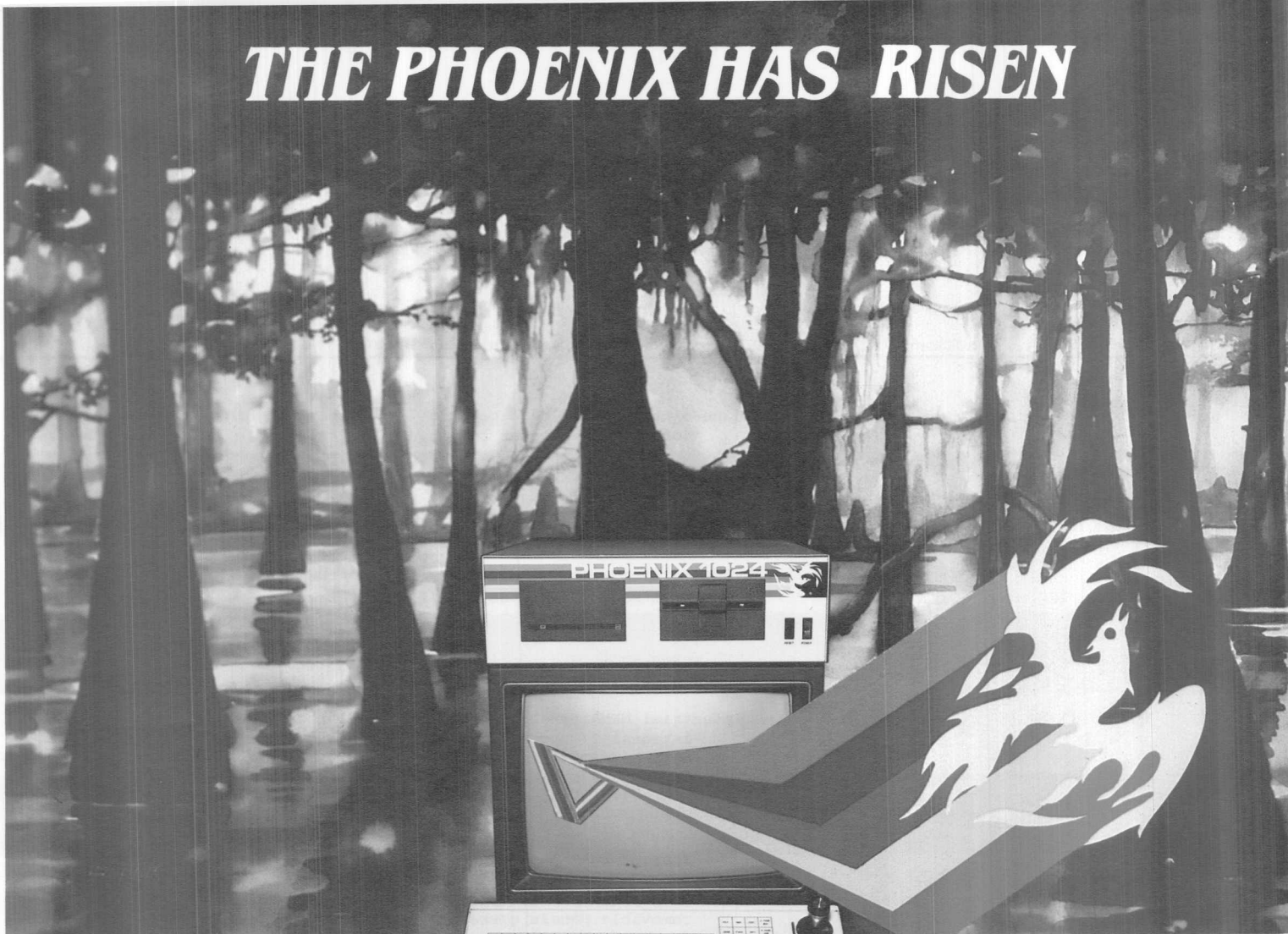
## Chassis

Manufacturer	Model	Price	DFA	Deliv.	Capacity (Slots)	Reset SW	P/S +5	Output -5	in Amperes			Fan(s)
Mesa Technology Corp... (301)948-4612	1010	\$2995	*10/82	-	9	o	40	3	1.7	1.7	N/A	2
Monolithic Systems .... (303)770-7400	MSC 8201	\$620	-	-	7 14*	o	*	*	*	*	N/A	1
National Semiconductor. See Sales Office Listing	RMC-660	\$1900	-	stk	8	o	30	1.75	4.5	1.75	N/A	2
	RMC-655	\$1500	-	stk	4	o	14	.9	2	.8	N/A	2
NEC Electronics ..... (617)655-8833	SPO 960	\$1895	2/82	30da	6	o	14	.9	2	.8	N/A	2
Panlmatic Company ..... (312)439-4030	796	\$1645	*12/82	stk	4	o	15	.7	3	2	N/A	1
Prototek, Inc. .... (513)874-5094	1261	\$2225	4/80	stk 8wk	11	o	50	1.5	5	5	N/A	2
	1262/18	\$2855	*10/82	stk 8wk	18	o	50 150*	1.5 -	5 10*	5 10*	N/A	3
	1262/461	\$-	*3/83	-	18	o	50 150*	1.5 -	5 10*	5 10*	N/A	2
Sibthorp Systems ..... (606)525-1300	ICP-100	\$2995	3/81	stk 30da	8 6,12*	o	20	3.5	5	3	N/A	*
	TCP-100-MB	\$3450	4/82	stk 30da	6	o	10	.25	3	2	-	1
Thomas Engineering Co..	MZ-RMC	\$1750	6/82	-	8	o	-	-	-	-	N/A	2
TITN, Inc. .... (415)348-9181 (612)831-4422	6890	\$1200	80	6wk	4 8,14*	o	20	3	3	3	-	4
Zendex ..... (415)828-3000	ZX-655A	\$1467	10/80	2wk	4	o	14	.9	2	.8	N/A	2
	ZX-660A	\$1755	7/80	2wk	9	o	30	1.75	4.5	1.75	N/A	4
	ZX-700F	\$950	2/80	2wk	N/A	-	7	1.2	N/A	1.2	3.5	2
	ZX-700W	\$1295	-	2wk	N/A	-	15	N/A	4	2	2	2
	ZX-950	\$2799	-	2wk	9	o	40.5	1.75	4.5	3.25	7.5	4



Dimensions (in.)			Rackmount	Slides	Distinguishing Features
Height	Width	Depth			
6.84	19	20.56	o	*	Nine-slot Multibus card cage in 7-inch chassis. High efficiency +5V 40A switching power supply. Switch selectable 115/230V, 50/60 Hz operation. Hinged removable front and rear panels. 200 CFM dual fan for
5.25	19	8.875	o	*	Switch indicators for RESET and nonmaskable interrupt.
7	19	20	o	-	Alternate source for iSBC 660, 12 mo. warranty.
3.5	19	20	o	*	Alternate source for iSBC 655, 12 mo. warranty.
7.2	19	22.1	-	-	Table-top enclosure; 6-slot card cage; power supply; cooling fans; indicators and switches; rear panel connectors.
17	8.5	11.5	-	-	Industrial NEMA panel mount; front panel rotary switch and LEDs on integral I/O port; removable switching supply with filter, power fail and RTC; pre-punched I/O panel; options and customizing available.
8.25	19	19	o	o	Switching power supply; optional 300W power supply; rackmount or stand alone; with keylock or push-push front panel; connector cut-out rear panel. Optional vertical card cage.
10.5	19	24	o	o	Switching power supply; optional 750W p/s; RM or stand alone; key-lock or push-push front panel; connector cutout rear panel, PPR.
12.2	19	21.5	-	-	Switching p/s, opt. 750W p/s; designed to meet Mil-Std-461; all removable panels gasketed; backplane EMI "D" type connectors.
9	18	15.75	-	-	NEMA panel mounting industrial enclosure; diagnostic front panel; power line filter; power fail detect/restart circuitry; battery back-up capability for RAM; battery charger; 150W (200W) p/s.
9	18	16.5	-	-	Portable enclosure; slide drawer keyboard assembly; 9" CRT; integral cassette recorder; 152 key "touchpad" keyboard; optional video, RAM, cassette and keyboard control boards.
-	-	-	-	-	150W switching power supply.
3.5	19	10	-	-	
3.5	19	17	o	*	Linear power supply. Includes ZX-904 interrupt control panel.
7	19	17	o	*	Linear power supply. Includes ZX-904 interrupt control panel and a ZX-903 PIO card.
7	19	17.5	o	*	Dual floppy disk drive chassis. Includes all internal and external cables for Shugart SA-801's.
7	19	17.5	o	*	For up to two Winchester type disk drives and controller card. Includes all internal and external cables for two Shugart SA-1004's and a DTC-1004.
17.5	19	24	o	*	Same as ZX-900 but may be table-top or rackmounted.

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tion of your video data.

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## Multibus Systems

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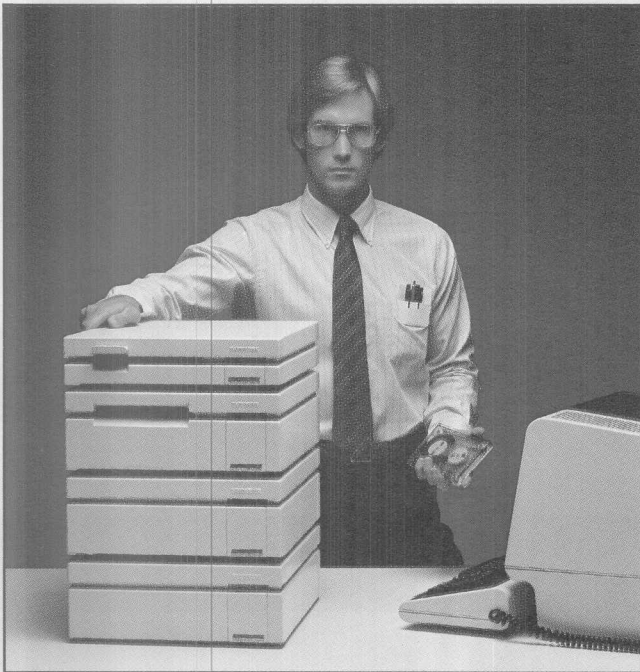
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## Multibus Systems

Manufacturer	Model	DFA	Type	Price \$K	CPU	Memory	Mass Storage (MB)		
				OEM LIST	Clock Speed	(KB)	Hard Disk	Floppy	Tape
Altos Computer Systems... (201)228-5748	Series 5-5D	-	Multi-user System	\$6.49	Z80A 4	192 RAM	5	1	*
	ACS8000	-	Multi-user System	\$3.65	Z80A 4	64 208*	*	1	*
	ACS8600	-	Multi-user System	\$-	8086 5	500 1MB*	10	-	*
Bridge Communications... (408)446-2981	CS/1	8/82	Ethernet Communica- tions	\$-	68000 8	128	-	0	N/A
Callan Data Systems .... (800)235-7055	CD100M	-	Single user UNIX work station	\$9.95	68000 8	256 1MB*	10 21*	.6	N/A
CIE Systems ..... (714)957-1112	680	-	Micro Business Computer	\$-	68000 8	256 1MB*	10 300*	-	-
Codata Systems Corp. ... (408)735-1744	3300	-	Multi-user System	\$13	68000	320 1.25*	10 68*	1*	10*
Comark Corporation ..... (617)894-7000	MB851	-	Industrial Micro- computer	\$5.2	8085 5	64	10*	*	-
	MB85-M3	-	General Purpose	\$11.3	8085 5	64	18 36*	1	.3*
	DISKSTOR-M2	-	DAS, ATE, Office	\$8.59	8086 10	128	N/A	0	N/A
	DISKSTOR-M4	-	General Purpose	\$10.6	8086 10	128	18	1	N/A

I/O Ports		Expansion	Operating Systems	Languages/ Utilities	Distinguishing Features
Serial	Parallel	Slots			
4	1	-	CP/M, MP/M II, OASIS	-	
1	1	-	CP/M, MP/M II, OASIS	-	
9	1	1	CP/M, MP/M II, OASIS, UNIX	-	
8 32*	-	4	-	-	Designed to provide connection of non-networked devices to an Ethernet local area network.
2	-	4	UNIX V.7	FORTRAN, COBOL, PASCAL	Five CPU resident timers; integral VT100/VT52 - compatible video terminal; display; 83-key keyboard; 8-slot card cage.
-	-	-	UNIX, REGULUS RM/COS	BASIC, FORTRAN, COBOL, PASCAL	PRO-IV applications processor.
2 18*	-	-	UNISIS	FORTRAN-77, RM/COBOL, BASIC, SMC BASIC, APL, PASCAL	
-	-	-	-	-	Optional 10 MHz 8086 version (Model MB85-M3); environmentally sealed aluminum enclosure; 8-slot card cage; 12" monitor.
-	-	-	CP/M 2.21	FORTRAN, BASIC, PASCAL	
1	1	-	MSDOS, CP/M-86*	-	Includes 8-slot card cage, 3 fans, and 200W switching P/S.
1	1	5	MSDOS, CP/M-86*	-	9511A Floating Point Processor; nine interrupt levels; three 16-bit interval timers; 2 SBX connectors.

continued next page

## Multibus Systems

Manufacturer	Model	DFA	Type	Price \$K	CPU	Memory	Mass Storage (MB)		
				OEM LIST	Clock Speed	(KB)	Hard Disk	Floppy	Tape
Edge Micro Systems .....	EDGE-86	2/81	Industrial System	\$1.25	8086	128	N/A	0	N/A
					-				
Cosmos Systems, Inc. ...	CMS-16	-	Microcomputer System	\$-	68000	64	-	-	-
					8	1MB*			
	CMS16/UNIX	-	Multi-user, Multi-tasking	\$-	68000	256	10	1	N/A
					-	3MB*	40*		
Fortune Systems Corp. ...	32:16	-	Desktop Computer	\$4.9	68000	128	*	1	N/A
					-	1MB*			
Ekier Technology, Inc. .	EAGLE-1	3/82	Graphics System	\$24	8086	-	10	1	N/A
					-				
Intel Corporation .....	86/330A	-	OEM Microcomputer System	\$23.5	8086	384	35	1	N/A
See Sales Office Listing					5	1MB*			
	86/380A	-	OEM Microcomputer System	\$30.5	8086	384	35	1	N/A
					5	1MB*			
	86/380T	-	OEM Microcomputer System	\$-	8086	384	35	N/A	17MB
					5	1MB*			
	86/330X	-	OEM Microcomputer System	\$25	8086	384	35	1	N/A
					5	1MB*			
	86/380X	-	OEM Microcomputer System	\$32	8086	384	35	1	N/A
					8	1MB*			



I/O Ports		Expansion		Operating Systems		Languages/ Utilities	Distinguishing Features
Serial	Parallel	Slots					
3	2	2	CP/M-86		FORTRAN-77, MS-DOS, MPM/86 MBASIC, CBASIC-86, PASCAL, COBOL	DMA floppy controller controls up to 4 drives.	
-	-	-	-		-		
-	-	5	UNIX V.7		C, PASCAL, FORTRAN, BASIC, COBOL		
-	-	-	UNIX		-		
4	-	-	CP/M-86, MP/M 86		FORTRAN, C, BASIC	High resolution (1024 x 800 pixels); 16 grey levels; bit mapped raster display, non-interlaced; 17" Dmonitor; Optional 8087 Floating point processor.	
1	1	2	iRMX 86 (Real-time O.S.)		PL/M, Assembler, Utilities	Large mass storage (35MB + 1MB) capabilities. Floating point math in VLSI recognized and certified by UL/CSA/FCC standards for class A	
1	1	11	iRMX 86		PL/M	Extra large expansion capabilities: 10 extra Multibus slots, 1 extra 8" peripheral slot. Designed to meet UL/CSA/FCC standards.	
-	-	11	iRMX 86		PL/M	Same as above but additional backup and storage on streamer tape as well as hard disk.	
5	-	1	XENIX 86 (UNIX V.7)		C, Assembler	Support for 5 RS-232C terminals. Customized memory management Multimodule. 35Mbyte + mass storage. Certified by UL/CSA/FCC.	
5	-	10	XENIX 86 (UNIX V.7)		C. Assembler	Same as SYSTEM 86/330X Extra large expansion, 10 extra Multibus slots, one extra 8" peripheral slot.	

## Multibus Systems

Manufacturer	Model	DFA	Type	Price \$K	CPU	Memory	Mass Storage (MB)		
				OEM LIST	Clock Speed	(KB)	Hard Disk	Floppy	Tape
Intellimac, Inc. ....	IN/7000M	10/82	General Purpose Microcomputer System	\$46.6	68000 8	256 1MB*	160	N/A	o
NCR .....	Tower (800)222-1235 1632	*83	Business Micro- computer	\$6.9	68000 10	o 2MB*	84*	1*	*
Pacific Microcomputers .	PM100 (619)436-8649	82	UNIX Workstation	\$13.9	68000 8	256 1MB*	20 80*	1	N/A
	PM400	*83	UNIX Workstation (Multi-user)	\$29.9	68000 10	256 1.5MB*	84 320*	-	o
Phoenix Computer .....	1024 Graphics (318)234-0063	*10/82	Color Graphics System	\$23.1	8086/87	128 256*	10 30*	1	o
Scientific Micro .....	MDX8017 Systems, Inc. (415)964-5700	*12/82	General Purpose Microcomputer System	\$6.9	-	-	*	*	N/A
	DSX8017	5/82	General Purpose Microcomputer System	\$6.1	-	-	*	*	N/A
Summagraphics Corp. ....	SG-48-BL	-	Microcomputer/ Digitizer	\$7.5	-	-	-	-	N/A
Sun Microsystems, Inc. .	100 (415)960-1300	-	Workstation	\$12.9	68010 10	1 2MB*	84*	-	*
Wicat Systems .....	150	-	Multi-user System	\$9.4		256 1.5MB*	10 60	1	-

I/O Ports		Expansion Slots	Operating Systems	Languages/ Utilities	Distinguishing Features
Serial	Parallel				
8	-	-	UNIX V.7, ADA	FORTRAN-77, COBOL PASCAL, C	.21-slot chassis; 8 to 16 Busmasters; 1MB error- detection and -correction memory on the lens.
2	-	-	Derived from UNIX	COBOL, Business BASIC, FORTRAN, C	Optional expansion units, memory, I/O; includes 32KB ROM for system start-up, initialization and diagnostics.
2 10*	-	5	UNIX	-	Self-contained in video display terminal multi- user available. (O.E.M. quantity discount available.)
10	-	7	UNIX	-	DEC look-alike cabinetry available.
1	1	-	CP/M-86	-	High resolution (1024 x 1024 x 8); "stand-alone" or integrated as a peripheral to a host; Optional "Graphics Board Set."
-	-	3	iRMX 86	-	Includes Model FWD 8006 controller; 8 or 16-bit data transfer.
-	-	6	iRMX 86	-	Includes 8" Winchester controller to 75.6MB, and SA850 floppy.
1	*	-	-	-	High resolution-accuracy digitizer in large size tablets with both opaque and backlit surfaces. 5 or 16 button cursor.
2	-	4	UNIX V.7	C, Assembler	
2 3*	1	0	UNIX V.7, CP/M	C, FORTRAN, COBOL BASIC, APL, ADA, LISP, Assembler	6-slot chassis, optional System 160, 1 to 12 users; System 200, 8-32 users.

## Multibus Systems

Manufacturer	Model	DFA	Type	Price \$K	CPU	Memory	Mass Storage (MB)		
				OEM LIST	Clock Speed	(KB)	Hard Disk	Floppy	Tape
Zendex Corp. .... (415)828-3000	95/86RMX	*3/83	O.E.M. Gen. Purpose	\$19.9	8086/87 -	512 728*	40 180*	o	N/A
	95/35	*1/83	O.E.M. Gen. Purpose	\$8.9	8085 -	64	- 20*	o	N/A
	235	-	Workstation	\$6.9	8085	64	-	o	N/A
	95/38	*3/83	Gen. Purpose	\$10.2	8088	128 1MB*	- 20*	o	N/A
	838	*1/83	Gen. Purpose	\$10.2	8088	128 1MB*	- 20*	o	N/A
	95/36	*4/83		\$9.2	8086	256 1MB*	- 20*	o	N/A



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I/O Ports		Expansion Slots	Operating Systems	Languages/ Utilities	Distinguishing Features
Serial	Parallel				
1 5,9*	-	6	iRMX 86	-	Real-time 16-bit RMX-86 O.E.M. and development system. Optional ECC. MFM, FM; Rackmount and Tabletop.
-	-	7	CP/M-80	ISIS-II	Optional versions include 10MB or 20MB Winchester; MMFM, FM.
-	-	-	CP/M-80	ISIS-II	Compact workstation.
-	-	7	CP/M-86	-	MDS-286 file and diskette compatible, Integrated system chassis; MMFM, FM.
-	-	6	CP/M-86/UDI	-	MDS-286 file and diskette compatible; modular chassis; MMFM, FM.
-	-	7	CP/M-86	-	High performance CP/M-86 with diagnostics. 2 expansion 8" peripheral slots. Integrated system chassis. Optional modular chassis version.

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## Avoiding Common Multibus Configuration Mistakes\*

Over the last few years, many people have called Intel's customer service engineers for assistance in configuring their Multibus-based systems. During the process of helping these people, Intel's engineers realized that a handful of simple errors were causing the vast majority of the configuration problems. The purpose of this material is to inform you of these common configuration errors so you can avoid them when you configure your Multibus-based systems.

This information is organized into seven major sections, each of which discusses one of the most common errors in

configuring your Multibus-based system.

The sections are:

- Deciding what boards occupy what slots
- Resolving bus priority
- Generating BCLK/ and CCLK/ signals
- Avoiding accidentally overlapped memory
- Using time-out jumpers
- Delaying processing of interrupts
- Ensuring uniform compliance with the Multibus Specification

This material discusses the symptoms of these errors and explains how to avoid the errors before they cause your Multibus-based system any problems.

### Deciding What Boards Occupy What Slots

If your Multibus-based system consists of more than one board, you must decide what board is to occupy what slot. The Multibus architecture allows a lot of freedom in this area but, for some boards, you must take special precautions. Specifically, when placing boards that generate or use either BCLK/ or CCLK/, heed the following guidelines:

- For boards using the BCLK/ signal, you should ensure that the receivers are closer to the terminators than is the generator of BCLK/. You should also

place the whole collection as close to the terminators as possible.

- If your system uses the CCLK/ signal, follow the same guidelines as for the BCLK/ signal. Ensure that the receivers of CCLK/ are closer to the terminators than is the generator of CCLK/, and try to place the entire collection as close to the terminators as possible.

The reasons for this suggestion are related to signal-to-signal coupling and signal ringing. For more details, refer to Chapter 2 of this guide.

### Resolving Bus Priority

The *most common mistake* in configuring a Multibus system is incorrectly specifying the technique for resolving bus priority. Symptoms of this mistake generally include the ability to perform on-board operations correctly while being unable to perform operations that require several boards. One specific example is the ability to access on-board memory while not being able to access memory on a different board. Another example is a board's inability to process bus-vectored interrupts even though the board is configuring to do so.

#### Why Resolve Bus Priority?

When your system contains more than one master board, the master boards must compete for access to the Multibus lines. If two masters simultaneously write

information to the bus, the information will be corrupted and neither master will complete its operation successfully. The purpose of resolving bus priority is to allow each Master board a period of exclusive access to the bus.

#### How is Priority Resolved?

Each Multibus compatible master board contains hardware that automatically resolves bus priority. There are two techniques that this hardware can use — serial resolution, or parallel resolution. When you configure your system, you must decide which technique to use, and you must ensure that all master boards in your system use the same technique. If you fail to do this, you will encounter the symptoms described earlier.

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In any Intel iSBC hardware reference manual, you can find instructions for specifying serial or parallel resolution. So this chapter does not contain these instructions. Instead, it provides you with reasons for choosing one technique or the other.

## Choosing Between Serial And Parallel Resolution

Each of the two resolution techniques has advantages and disadvantages. Specifically:

- Serial Resolution  
Serial resolution involves no special

hardware, but it can be used only in systems having three or fewer master boards.

- Parallel Resolution  
Parallel resolution allows a system to contain as many as 16 master boards. However, it requires that the backplane have special hardware to help resolve priority, and it is generally more complex to set up than is serial resolution.

Consequently, the guidelines are as follows. If your system contains three or fewer master boards and is not likely to require more in the future, you should probably use serial resolution. Otherwise, use parallel.

## Generating BCLK/ and CCLK/ Signals

The BCLK/ signal is required in every Multibus-based system, and the CCLK/ signal is required in some. The purpose of the BCLK/ signal is to synchronize the master boards of the system. In contrast, the purpose of the CCLK/ signal is to provide a system-wide 10 Megahertz oscillator for any board to access.

If you adhere to the following guidelines, you will avoid the problems that can be caused by improper BCLK/ and CCLK/ signals:

- BCLK/  
Every Multibus-based system requires the BCLK/ signal, but only one board can drive the signal. If no boards drive it, the master boards in your system will not be able to access other boards. For example, absence of the BCLK/ signal might allow a master board to access on-board memory while not being able to access off-board memory.

On the other hand, if more than one board generates the BCLK/ signal, several

master boards may access the bus simultaneously, corrupting addresses and data.

- CCLK/  
Many Multibus-based systems do not require the CCLK/ signal. If your system does not contain any boards that require the signal, disable the signal.

If some boards in your system need CCLK/, you must ensure that it is generated by exactly one board. If several boards generate CCLK/, the combined signal will cause boards receiving CCLK/ to malfunction. For example, multiple CCLK/ signals could lead to premature generation of XACK/ signals, which could cause data to be corrupted.

In contrast, if CCLK/ is not generated and some board needs it, the board attempting to receive CCLK/ might fail to generate XACK/, causing another board in the system to timeout or hang.

## Avoiding Accidentally Overlapped Memory

Most iSBC boards containing memory allow you to designate the addresses of the on-board memory. If, while doing so, you assign one set of addresses to more than one collection of memory, you have overlapped memory. Sometimes this is done intentionally to provide "shadow" memory. But if it happens accidentally, it leads to undesirable behavior in your system.

Precise symptoms of overlapped memory are difficult to predict because they depend upon what types of memory have been

overlapped. Consider the following example. Suppose that you assign the single-post, on-board memory for Master Board A to the same locations as the memory on a slave memory board. Now suppose that Master Board B attempts to access the overlapped memory. It will receive the contents of the slave memory. In contrast, if Master Board A attempts to access the overlapped memory, it will receive the contents of its on-board memory.

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The most common symptom of overlapped memory is that one set of memory addresses always seems to contain incorrect information. However, other symptoms may also appear. If your system seems to access memory in an

unpredictable manner, and you have already verified that the clock signals are correct and that priority resolution is correct, check the address settings for all the boards in your system. You may have overlapped memory.

## Using Time-Out Jumpers

Each Intel iSBC master board has a time-out (or failsafe) jumper. The purpose of this jumper is to allow you to select the behavior that you want the board to exhibit when the processor accesses a nonexistent memory address or I/O port. If the *jumper is not connected*, and the processor accesses a nonexistent memory address or I/O port, the processor will go into an infinite wait state, appearing to have ceased executing. In contrast, if the *jumper is connected*, the processor will continue running, unaware that the memory or I/O port does not exist, and unaware that any data received is invalid.

In most systems, the time-out jumper should be disconnected, ensuring that the processor does not continue running after accessing nonexistent ports or memory. However, there are situations in which the jumper should be connected.

For example, suppose that you want your system to find out what memory exists and what memory does not. You can create a program called a memory scanner that

writes a fixed pattern into a word, and then reads it. If the information read differs from the information written, the memory scanner can conclude that the memory location addressed does not exist in the system. By repeating this procedure for each word in the address space, the memory scanner can find out which addresses actually have memory. This memory scanner requires that the time-out jumper be connected because, if it is disconnected, the processor will cease execution upon accessing the first missing memory location.

Consciously decide whether to connect or disconnect the time-out jumper. This jumper can be a very powerful ally if you use it knowingly. On the other hand, if you choose to ignore it, and it happens to be configured incorrectly, you might spend hundreds of man-hours trying to find the cause of your system's sudden failure or gradual corruption. You can find more-specific information about the time-out (failsafe) jumper in your iSBC board's hardware reference manual.

## Delayed Processing of Interrupts

When you place your boards into your system, you must assign a priority to each master board. This allows the system to decide which board obtains next access to the bus when several boards want access simultaneously. (This is discussed in the "RESOLVING BUS PRIORITY" section of this chapter and in the hardware reference manual for your board.)

If one of your low-priority boards receives an interrupt but cannot quickly obtain access to the bus, either of two problems may arise:

1. If the board's time-out (failsafe) jumper is connected, and the board waits for bus access long enough for the time-out mechanism to send a READY signal to the processor, the processor will immediately resume running.
2. When the board finally obtains access to

the bus, the interrupt signal might no longer be present.

The first case, caused by the time-out jumper being connected, generally causes failure of the system. When the processor resumes running, it reads data unrelated to the interrupt and interprets the data as the address of the next instruction. This causes the processor to start executing instructions at some random location in memory. To eliminate this problem, simply disconnect the time-out jumper. This will allow the processor to wait as long as necessary for valid access to the bus.

In the second case, when the board finally accesses the Multibus lines and starts processing, the interrupt signal is no longer available. If the board uses an 8259 interrupt controller to process interrupts, the



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8259 deems the missing interrupt as spurious and routes the interrupt to Level 7. Even if the level 7 interrupt-servicing code checks for spurious interrupts, it cannot ascertain the level on which the interrupt actually occurred.

The best way to avoid this kind of problem is to adhere to the following guidelines:

- Recognize which boards must access the Multibus lines after an interrupt. These

boards fall into two classes — those that receive bus-vectored interrupts, and those that execute instructions located in off-board memory.

- Assign these boards sufficiently high priority to ensure rapid access to the Multibus lines.
- Be careful to allow no master board to lock up the Multibus lines for excessive periods of time.

## Ensuring Uniform Compliance With The Multibus Specification

Some Multibus-compatible products adhere to only a subset of the Multibus specification. You can use these products in your system, but you must ensure that the configuration of the system matches the requirements of these products. If you neglect to take time to understand the degree of compliance before using such products, you can introduce serious problems into your system. Pay special attention to the following issues.

### Number of Address Lines

What is your system's address range? For example, if the processor boards in your system use 20-bit addresses, they can access a megabyte of memory. However, if one memory board in your system uses only 16-bit addresses, it assumes that the system contains no more than 64k bytes of memory. Consider what happens when the less-capable board receives a 20-bit address from the Multibus lines. It ignores the high-order four bits of address, and always assumes that the low order 16 bits are the entire address. In other words, if this system contains more than 64k of memory, the less-capable memory board will overlap higher memory locations.

You can avoid this problem by ensuring that all boards in your system accept and generate addresses wide enough to accommodate the largest address in the system.

### Number of Data Lines

Memory access capabilities must be compatible throughout the system. For example, some memory boards transfer data only a byte at a time, while other memory boards can transfer data either a byte or a word at a time. If, for example, your system uses an 8086 processor, the

processor expects to be able to receive 16-bit instructions. This is not compatible with memory boards that transfer data only a byte at a time. You can avoid problems by ensuring that your memory boards are compatible with your processor boards.

### Common Bus Request Signal

The common bus request (CBRQ/) signal is not supported by some older Multibus-compatible master boards. If you use new master boards in conjunction with these old master boards, the CBRQ/ signal will work properly only if you assign all of the older boards priorities higher than those of the new boards. You may however, elect not to use the CBRQ/ signal, in which case you can configure your boards with a different set of priorities. To find out if a particular board uses CBRQ/ refer to the part of the board's hardware reference manual that describes bus arbitration.

### Partial Bus-Master Capability

Some boards can serve as bus masters only when special conditions are met. The iSBC 569 and the iSBC 80/10B boards are two examples of boards that have only partial bus master capability.

If your system contains boards having only partial bus master capability, and you intend to use the boards as bus masters, your system must meet the special conditions that are spelled out in the board's hardware reference manual.

### Relying on the Lock/Signal

A final consideration is the Multibus LOCK/ signal. The purpose of LOCK/ is to allow one processor board in a multiprocessor system to obtain exclusive access to off-board dual-port RAM by locking all other processors out of the dual-port RAM.

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The table below shows which boards generate and receive LOCK/, and which boards have dual-port RAM. In the future,

most Intel processor boards will generate LOCK/, and most Intel processor boards having dual-port RAM will receive LOCK/.

## Board Characteristics Relating To The LOCK/ Signal

iSBC 80/10B iSBC 80/24 iSBC 80/30* iSBC 86/12* iSBC 88/25	NEITHER GENERATE NOR RECEIVE LOCK/
iSBC 86/05	ONLY GENERATES LOCK/
iSBC 589*	ONLY RECEIVES LOCK/
iSBC 86/14* iSBC 86/30* iSBC 88/40* iSBC 88/45*	GENERATE AND RECEIVE LOCK/
Boards marked with an asterisk (*) can contain dual-port memory.	

If your system contains multiple processors, some of which require exclusive access to dual-port RAM, the easiest way to obtain such access is to use the LOCK/ signal. If you wish to use the LOCK/ signal for this purpose, you should restrict your selection of processor boards to the following two categories:

- Processors that both generate and receive the LOCK/ signal.

- Processors that only generate the LOCK/ signal but that contain no dual-port RAM.

If your system contains processor boards that are not in one of these categories, the system can still provide exclusive access to off-board dual-port RAM by using special software protocols other than the LOCK/ signal.

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Brookfield.....(414)784-9379

Bubbl-tec

Div. of PC/M Inc.  
6800 Sierra Ct.  
Dublin, CA 94566.....(415)829-8700  
TWX/Telex 910-389-6890

## Sales Representatives:

CA Datarep, Inc.  
San Jose.....(408)279-1212

NM Sota-Com, Inc.  
Las Cruces.....(505)523-4480

OR Tasco, Inc.  
Portland.....(503)245-8168

WA Tasco, Inc.  
Bellevue.....(206)453-1414

TX Dyna Marketing  
Houston.....(713)937-0278

Dallas.....(214)243-7994

## INTERNATIONAL

West Germany  
Scantec GmbH  
Munich.....(089)134093  
TELEX: 5213219 SCAN D

## Italy

Telcom (pietro Bonoldi)  
Milano.....02-4047648  
TELEX: 335654 TELCOM I

## France

Microel S.A.  
Les Ulis.....907.08.24  
TELEX: 692493

## Switzerland

Micro-System-Technik, AG.  
Zurich 01-520355  
TELEX: 822097 MST CH

## South Africa

Electronic Building Elements  
Pretoria  
TELEX: 3-0181 SA

Burr-Brown Research Corporation  
Industrial Systems Products Division  
3631 East 44th Street  
Tucson, AZ 85713.....(602) 747-0711

Callan Data Systems  
2645 Townsgate Rd.  
Westlake Village, CA 91361 .....(805) 497-6837

CEA  
1 Aerovista Park  
San Luis Obispo, CA 93401.....(805) 544-5454

Centigram Corp.  
1153 Bordeaux Dr.  
Sunnyvale, CA 94086.....(408) 734-4012

Central Data Corporation  
1602 Newton Drive  
Champaign IL 61821.....(217) 359-8010  
TWX 910-245-0787

Sales Contact: Norman E. MacGregor

Sales Representatives:

X AL Synergetic Rep. Inc.  
Huntsville.....(205) 882-1691

CA Qualtech Assoc.  
Palo Alto.....(415) 494-9060

CO Eissler Sales & Serv.  
Littleton.....(303) 794-1779

FL Synergetic Rep., Inc.  
Largo.....(813) 586-2871

GA Synergetic Rep., Inc.  
Lawrenceville.....(404) 963-0968

IL First Rep. Co.  
Itasca.....(312) 773-9540

MA J. Redding Assoc.  
Acton, MA.....(617) 263-8206

MI KRW Sales  
Farmington.....(313) 476-6090

MN Applied Tech, Mrkt.  
Roseville.....(612) 488-1129  
(612) 488-0281

MO System Tech.  
Manchester.....(314) 225-4296

NJ Gebhardt  
Springfield.....(201) 375-4415

Central Data Corporation (Continued)

NC Synergetic Rep., Inc.  
Greensboro.....(919) 288-7566

OH KRW Sales  
Columbus.....(614) 464-1861

OK System Tech.  
Tulsa.....(918) 665-6340

PA Lynbar Group  
Huntingdon Valley.....(215) 947-3554  
Oakmont.....(412) 261-1323

PR Synergetic Rep., Inc.  
San Juan.....(809) 762-2688

TX System Tech  
Houston.....(713) 440-8340

VA Dyna Rep., Co.  
Alexandria.....(703) 354-1222

WA Showalter Inst., Inc.  
Bellevue.....(206) 455-4922

INTERNATIONAL

Australia  
X R&D Electronics  
TELEX: 790AA3288

Hong Kong  
Seed Hong Kong  
North Point.....  
TELEX: 78060313

Japan  
Microboards  
Chiba.....  
TELEX: 7812993122

England  
Data Translation, Ltd.  
Slough, Berks.....  
TELEX: 851849862

Spain  
Unitronics, S.A.  
Madrid.....

Switzerland  
Memotec, AG  
Langenthal.....  
TELEX: 84568636

New Zealand  
Technology Marketing, Ltd.  
Auckland.....

Netherlands  
C.N. Rood, B.V.  
Rijswijk.....  
Telex: 84431238



## Central Data Corporation (Continued)

## Belgium

C.N. Rood B.V.  
Brussels.....  
TELEX: 84622846

## Italy

Logitech, S.r.l.

## Canada

Electrodesign, Ltd.  
Lachine, Quebec .....(514)636-4383

## France

Kontron Electronique  
Villacoublay.....  
TELEX: 842695673

Century Computer

14453 Gillis Road  
Dallas TX 75234.....(214) 233-3238

Chen Digital Laboratories

16718 NE 41st  
Redmond, WA 98052.....(206)881-5031

Sales Contact: Wenwu Chen

Chrislin Industries

31352 Via Colinas #101  
Westlake Village, CA 91362.....(213)991-2254

Christian Rousing Corp.

1337 Thousand Oaks Blvd., Ste.220  
Thousand Oaks, CA 91362.....(805)497-6722  
Telex 910-336-5733

## DENMARK

Christian Rousing A/S.....(2)65 11 44  
Telex 35111 cr dk

## UNITED KINGDOM

Christian Rousing Systems (UN)Ltd. (1)74 92 532  
Telex 947157 crasuk

Codata Systems Corp.

285 N. Wolfe Road  
Sunnyvale, CA 94086.....(480)735-1744  
(800)521-6543

Comark Corporation

257 Crescent Street  
Waltham, MA 02154.....(617)894-7000  
TWX: 710-324-1503

Compumotor Corporation

1310 Ross Street  
Petaluma, CA 94952.....(707)778-1244  
Telex 510-744-2115 (800)358-9068

AR Industrial Controls Assoc.  
Eldorado.....(501)862-2051

CA Motion Systems  
San Jose.....(408)246-0641  
  
Motion Technology  
Northridge.....(213)993-3762

FL Mackay Smith & Associates  
Orlando.....(305)377-1513

IL KMA Sales  
Rolling Meadows.....(312)398-5300

MA Electro-Kinetics  
Wellesley.....(617)235-9415

MI McNaughton-McKay  
Madison Heights.....(313)399-7500

MN Components Marketing Assoc.  
Bloomington.....(612)888-1594

NJ Eastern Regional Sales Manager  
Little Falls.....(201)256-7987

NY Motion Control Sales  
Syosset.....(516)921-5656

Ross Equipment  
Rochester.....(716)271-5660

NC Jake Rudisill Associates  
Charlotte.....(704)377-6901

PA Exonic-Systems  
Pittsburgh.....(412)784-8400

Miller & Dietz Company  
Frazer.....(215)647-7373

WA Sweo Engineering  
Bellevue.....(206)644-2725

## CANADA

Motion Control Systems  
Ontario.....(416)743-7930

## GERMANY

(089)651-6464

Computer Products Corporation

2405 Annapolis  
Plymouth, MN 55441.....(612)559-2034

Sales Contact: S.A. (Stu) Reile

## Sales Representatives:

AZ Frontier Technology  
Scottsdale.....(602)998-4438

CA Data Rep  
San Jose.....(408)279-1212

Gemini Assoc.  
Irvine.....(714)731-4181

Los Alamitos.....(213)594-9618

N. Hollywood.....(213)846-2633

Orange.....(714)997-7745

San Diego.....(619)268-1181

CO Electrodyne  
Aurora.....(303)695-8903

FL Reynolds & Associates  
Cocoa Beach.....(305)784-4700

Ft. Lauderdale.....(305)581-6611

Longwood.....(305)788-2006

St. Petersburg.....(813)360-1484

GA Reynolds & Associates  
Atlanta.....(404)451-9558

HI Sam O. Hirota, Inc.  
Honolulu.....(808)535-9971

IL Mar-Con Associates  
Skokie.....(312)675-6450

KS Ramsey Associates  
Overland Park.....(913)649-6996

MD L.G. White  
Silver Spring.....(301)434-1555

MA Storex  
Westwood.....(617)329-9633

MI Carter, McCormic & Peirce  
Farmington Hills.....(313)477-7700

MN Micro Resources  
Minneapolis.....(612)830-1454

MO Ramsey Associates, Inc.  
St. Louis.....(314)878-5042

Computer Products Corporation (Continued)

NJ Gebhardt Marketing  
Springfield (201) 376-4415

NC Reynolds & Assoc.  
Winston Salem (919) 725-6196

OH Carter, McCormic & Peirce  
Englewood (513) 836-0951  
Cleveland (216) 779-5100

OK Cunningham Components Corp.  
Tulsa (918) 492-0390

OR Northwest Marketing Associates  
Portland (503) 297-2581

PA Monument Technical Assoc.  
Jenkintown (215) 884-3737  
Carter, McCormic & Peirce  
Pittsburgh (412) 372-4415

TX Cunningham Components Corp.  
Austin (512) 459-9100  
Dallas (214) 233-4303  
Houston (713) 461-4197

UT Electrodyne  
Salt Lake City (801) 486-3801

WA Northwest Marketing Assoc.  
Bellevue (206) 455-5846

INTERNATIONAL

Diamond Point International (216) 238-0200  
Telex 433-2049 DIAPT

Controlsmith, Inc.  
17 Airport Road  
Nashua, NH 03063 (603) 889-5986

Cosmos Systems, Inc.  
430 Toyama Dr.  
Sunnyvale, CA 94086 (408) 744-0721

Sales Contact: Ray A. Jones

CYB Systems, Inc.  
6448 Hwy 290 E. Ste D-106  
Austin, TX 78723 (512) 458-3224

Sales Contact: John Trimble

Datacube, Inc.

4 Dearborn Road  
Peabody, MA 01960.....(617) 535-6644

Sales Contact: Lynn F. Gentle

Sales Representatives:

AL Pen-Tech Assoc.  
Huntsville.....(205) 881-9298

AZ BFA Corporation  
Scottsdale.....(602) 994-5400

CA Qualtech Assoc.  
Palo Alto.....(415) 494-9060  
A-F Sales Engineering  
Pasadena.....(213) 681-5631  
Orange County.....(714) 641-2903  
San Diego.....(619) 226-8424

CO Electrodyne, Inc.  
Denver.....(303) 695-8903

FL Pen-Tech Assoc.  
Deerfield.....(305) 421-4989  
Casselberry.....(305) 421-4989

GA Pen-Tech Assoc.  
Marietta.....(404) 424-1931

IL Sumer, Inc.  
Rolling Meadows.....(312) 991-8500

IN Leslie M. DeVoe, Inc.  
Indianapolis.....(317) 842-3245

MD Robert Electronic Sales  
Catonsville.....(301) 788-2380

MA John Redding Associates  
Acton.....(617) 263-8206

MN Micro Resources, Inc.  
Minneapolis.....(612) 830-1454

NM BFA Corporation  
Albuquerque.....(505) 292-1212  
Las Cruces.....(505) 524-9693

NC Pen-Tech Assoc.  
Greensboro.....(919) 852-6000

OH Applied Data Management  
Cincinnati.....(513) 579-8108

Datacube, Inc. (Continued)

OR Northwest Marketing Assoc.  
Portland.....(503) 297-2581

PA Monument Technical Assoc., Inc.  
Jenkintown.....(215) 884-3737

TX Industrial Digital Systems Corp.  
Houston.....(713) 988-9421

UT Electrodyne, Inc.  
Salt Lake City.....(801) 486-3801

VA Robert Electronic Sales  
Richmond.....(804) 276-3979

WA Northwest Marketing Associates  
Bellevue.....(206) 455-5846

WI Sumer, Inc.  
Brookfield.....(414) 784-6641

Data Management Labs

2148 Bering Drive  
San Jose, CA 95131.....(408) 946-9424

Sales Contact: Donna M. Licot

Data Systems Design

2241 Lundy Avenue  
San Jose, CA 95131.....(408) 946-5800

Sales Representatives:

CA Data Systems Design  
Santa Clara.....(408) 727-3163

Huntington Beach.....(213) 493-2561  
(714) 891-8512

Gemini Associates  
San Diego.....(619) 268-1181

CO Westek Data Products  
Denver.....(303) 232-2250

GA Data Systems Design  
Atlanta.....(404) 394-7700

MD Data Systems Design  
Columbia.....(301) 596-0464

MA Data Systems Design  
Norwood.....(617) 769-7620

Data Systems Design (Continued)

MN First Rep Company  
Eden Prairie.....(612) 944-2097

NM BFA Corporation  
Albuquerque.....(505) 292-1212

Las Cruces.....(505) 524-9693

NY Crane & Egert Corp.  
Elmont.....(516) 872-0800

OH Data Systems Design  
Cincinnati.....(513) 489-6960

OR E.S./Chase Company  
Beaverton.....(503) 641-4111

PA Data Systems Design  
Blue Bell.....(215) 834-1044

TX Data Systems Design  
Dallas.....(214) 980-4884

BFA Corporation  
El Paso.....(915) 542-1762

UT Westek Data Products  
Salt Lake City.....(801) 261-0999

WA E.S./Chase Company  
Bellevue.....(206) 453-0765

Authorized Stocking Distributors

BFA Corporation

SSE Products

Data Technology Corporation

2775 Northwestern Parkway  
Santa Clara, CA 95051.....(408) 496-0434  
TWX: 910-338-2044



Data Translation

100 Locke Drive

Marlboro, MA 01752

TLX: 951646

President: Fred Molinari

## Sales Representatives:

AZ BFA Corporation  
Scottsdale.....(602)994-5400

CA A-F Sales Engineering  
Pasadena.....(213)681-5631

Thorson West  
Mountainview.....(415)964-9300

CO BFA Corporation  
Denver.....(303)777-8070

FL Teqspec  
Ft. Lauderdale.....(305)748-9292

Clearwater.....(813)725-2201

GA Teqspec II  
Atlanta.....(404)455-7222

IL Physics Equipment & Sales  
Downers Grove.....(312)960-4054

IN RDP Corp.  
Indianapolis.....(317)788-4296

MD KD Associates  
Linthicum.....(301)636-1151

MA Data Translation  
Marlboro.....(617)481-3700

MI Industrial Digital Systems  
New Hudson.....(313)437-0816

MN Prairie Associates  
Elk River.....(612)441-6190

NJ Gene Williams Associates  
Haddonfield.....(609)428-6060

NM BFA Corporation  
Albuquerque.....(505)292-1212

Las Cruces.....(505)524-9693

NY Crane & Egert  
Elmont.....(516)488-2100

TAE Rep, Inc.  
Binghamton.....(607)722-9265

## Data Translation (Continued)

NC Teqspec III  
Winston Salem.....(919)723-8102

OH RDP Corp.  
Cleveland.....(216)659-3138

Dayton.....(513)253-6175

OK Data Marketing Assoc.  
Tulsa.....(918)496-1457

OR Northwest Marketing  
Portland.....(503)297-2581

PA Data Acquisition Systems  
Murrysville.....(412)327-8979

TX Industrial Digital Systems  
Houston.....(713)988-9421

Data Marketing Associates  
Austin.....(512)451-5174

Dallas.....(214)661-0300

UT BFA Corporation  
Salt Lake City.....(801)466-6522

WA Northwest Marketing  
Bellevue.....(206)455-5846

WI Prairie Associates  
Waukesha.....(414)544-5683

## CANADA

Transduction Ltd. ....(416)625-1907

## AUSTRALIA

Werner Electronics Pty Ltd. ....268-2766

Ampec Electronics Pty Ltd. ....02/818/1166

## BELGIUM

C.N.Rood A.S. ....027352135

## CHINA

Imag Industries, Inc. ....(408)727-8222

## CHILE

Interlog.....2253689

## Data Translation (Continued)

## DENMARK

Imdata APS.....263 2233

## ENGLAND

Data Translation Ltd. ....6286 3412

## FINLAND

Turion OY.....90 377 787

## FRANCE

Sacasa.....630 68 39

## GREECE

Elecomp Ltd. ....9514944

## INDIA

Sapphire Innovators Pvt. ....231040

## ISRAEL

Dynamicon Ltd. ....3-727010

## ITALY

Eledra SPA.....02 34 9751

## JAPAN

ASR International.....03437-5471

Takachicho Koheki Co. ....03244 1111

## NETHERLANDS

C.N. Rood B.V. ....070-996360

## NEW ZEALAND

Anderson Digital Electronics .....693-008

## NORWAY

Electronix A/S.....02229850

## PERU

MBP Ingenieros S.A. ....321516

## PORTUGAL

Ditram Componentes E. ....54-5313

## SINGAPORE

General Engineers Corp.PTE 2729412

## Data Translation (Continued)

## SINGAPORE

General Engineers Corp.PTE.....2729412

## SOUTH AFRICA

Electronic Bldg. Elements PTY...27 118161782

## SPAIN

Instrumatic.....213199

Instrumatic.....2502577

## SWITZERLAND

Instrumatic AG.....01 7241410

Instrumatic SA.....22 360830

## SWEEDEN

Scancopter AB.....08289425

## TAIWAN

A-Tek Enterprises Co.  
Telex 785 8927

## WEST GERMANY

Stemmer Elektronik.....89 806061

## Datec Systems, Inc.

6725 Jimmy Carter Blvd.

Norcross, GA 30071 .....(404) 447-9202

Datel-Intersil, Inc.

11 Cabot Blvd.  
Mansfield, MA 002048 (617) 339-9341  
TLX: 951340  
TWX: 710-346-1953

Sales Contact: Harlen Batchelder

AL International Scientific Instruments  
Huntsville.....(205) 533-6880

AZ Tech. Sales, Inc.  
Phoenix.....(602) 246-1614

CA Datel-Intersil, Inc.  
Santa Ana.....(714) 835-2751  
Sunnyvale.....(408) 733-2424

CO Cleveland Enterprises of Colorado  
Denver.....(303) 751-3252

CT JBL Associates  
Hamden.....(203) 281-3161

FL H.A. Inc.  
Coral Springs.....(305) 752-7520  
Largo.....(813) 595-8170

GA International Scientific Instruments  
Atlanta.....(404) 452-0144

HI Adtech, Inc.  
Honolulu.....(808) 941-0708

IL Sector Engineering Sales, Inc.  
Elmhurst.....(312) 530-7850

IN Sector Engineering Sales, Inc.  
Indianapolis.....(317) 842-1120

IA Technical Representatives, Inc.  
Cedar Rapids.....(319) 393-1300

KS Technical Representatives, Inc.  
Wichita.....(316) 681-0242

MA Datel-Intersil, Inc.  
Mansfield.....(617) 339-9341

MI Electro Sales Assoc.  
Livonia.....(313) 474-7320  
Portage.....(616) 323-2416

MN J.R. Associates  
Minneapolis.....(612) 559-5673

MO Technical Representatives, Inc.  
Earth City.....(314) 291-0001  
Kansas City.....(816) 756-3575

Datel-Intersil, Inc. (Continued)

NM Cleveland Enterprises, Inc.  
Albuquerque.....(505) 265-7893

NY Astrorep, Inc.  
Babylon.....(516) 422-2500  
Liverpool.....(315) 457-0100

NC Everett Bolte Sales  
Greensboro.....(919) 294-4141

OH Instrumentation Systems, Inc.  
Cleveland.....(216) 845-8800  
Dayton.....(513) 294-2838

PA Wyncote Instrumentation Company  
Glenside.....(215) 572-6500  
Pittsburgh.....(412) 243-1111

TX Technical Marketing, Inc.  
Carrollton.....(214) 387-3601  
Houston.....(713) 777-9228  
Austin.....(512) 835-0064

UT Cleveland Enterprises of Colorado  
Salt Lake City.....(801) 355-8424

VA H.J. Heffernan Company  
Arlington.....(303) 522-6666

WI Sector Engineering Sales, Inc.  
Milwaukee.....(414) 352-8280

Dawn Technology, Inc.

2403 DeLaCruz Blvd.  
Santa Clara, CA 95050.....(408) 980-1122

Delta Tau Data Systems, Inc.  
21115 Osborne St.  
Canoga Park, CA 91304.....(213)998-2095

Densan Co., Ltd.  
Meiwa Bldg., 23-11,1-Chome, Kamitakaido  
Suginamiku, Tokyo, Japan 168.....03-329-3871

Digital Pathways, Inc.  
1060 East Meadow Circle  
Palo Alt. CA 94303.....9415)493-5544

Distributed Computer Systems  
223 Crescent Street  
Waltham, MA 02154.....(617)899-6619  
(800)225-4589

Sales Representatives:

AL Pen-Tech  
Huntsville.....(205)881-9298

CA Qualtech Associates  
Palo Alto.....(415)494-9060

Los Angeles.....(213)410-0477

FL Pen-Tech  
Deerfield Beach.....(305)421-4948

Casselberry.....(305)645-3444

GA Pen-Tech  
Marietta.....(404)424-1931

IL Insko  
Antioch.....(312)395-8181

Braidwood.....(414)342-5534

MA Eastmark  
Needham.....(617)449-0050

MI Carter, McCormic & Peirce  
Farmington Hills.....(313)477-7700

MO Kemco, Inc.  
St. Louis.....(314)524-0820

NJ Ribble Engineering  
Saddlebrook.....(201)791-0233

OH Carter, McCormic & Peirce  
Cleveland.....(216)779-5100

Dayton.....(513)222-7700

Distributed Computer Systems (Continued)

PA Carter, McCormick & Peirce  
Pittsburgh.....(412)372-4415

TX Kemco, Inc.  
Irving.....(214)255-0537

Stafford.....(713)499-2701

WA K & E Computer Systems  
Spokane.....(509)487-2882

WI Insko  
Milwaukee.....(414)342-5534

Diversified Technology, Inc.

112 E. State St.  
Ridgeland, MS 39157.....(601)856-4121  
TELEX: 585326-ERGON INC JKS



Douglas Electronics, Inc.  
718 Marina Blvd.  
San Leandro, CA 94577.....(415)483-8770

Sales Contact: Nancy Lester

DSP Systems Corporation  
1081 North Shephard St.. M/S-E  
Anaheim, CA 92806.....(714)630-1330

CA Qualtech Associates  
Palo Alto.....(415)494-9060

#### JAPAN

Kyokuto Boeki Kaisha, Ltd.  
Tokyo  
Telex: J22440KYOKUBO

#### ENGLAND

M.C.P. Electronics Ltd.  
Middlesex.....(01)902-5941  
Telex: 923455MCP G

#### FRANCE

Metrologie  
Asnieres.....(1)791 44 44  
Telex: 611488

Edge Micro Systems  
195 W. El Camino Real  
Sunnyvale, CA 94086.....(408)738-4729

Sales Contact: Shun-Ning Wang

EECO Incorporated  
1601 E. Chestnut Ave.  
Santa Ana, CA 92702.....(714)835-6000  
TWX: 910-595-1550  
Telex: 67-8420

EG&G Reticon  
345 Potrero Ave.  
Sunnyvale, CA 94086.....(408)738-4266  
TWX: 910-339-9343

Electronic Control Technology  
763 Ramsey Ave.  
Hillside, NJ 07205.....(201)686-8080

Eirich Machines, Inc.  
663 5th Avenue  
New York, NY 10022.....(416)832-2241  
Telex: 06-964549

Electronic Solutions  
5780 Chesapeake Ct.  
San Diego, CA 92123.....(619)292-0242  
Telex II (TWX): 910-335-1169

#### Sales Representatives:

AL Remco  
Huntsville.....(205)533-3763

AZ Mar Tech Associates, Inc.  
Scottsdale.....(602)994-1285

CA Qualtech North  
Palo Alto.....(415)494-9060

Qualtech South  
North Hollywood.....(213)765-1419  
Orange.....(714)639-9820

Mesa Engineering  
San Diego.....(619)278-8021

CO Eissler Sales & Services  
Littleton.....(303)794-1779

CT Bell Controls  
Canton.....(203)693-8926

FL Reynolds & Associates  
Kissimmee.....(305)846-1306

Cocoa Beach.....(305)784-4700

Ft. Lauderdale.....(305)581-6611

St. Petersburg.....(813)360-1484

GA Remdo  
Atlanta.....(404)447-6937

IL Mar Con Associates, Inc.  
Skokie.....(312)675-6450

IA The Beams Co.  
Des Moines.....(515)255-1148

KS The Beams Co.  
Shawnee Mission.....(913)631-0300

## Electronic Solutions (Continued)

MD Spectro Associates  
Rockville.....(301) 279-2010

Spectro Associates  
Annapolis.....(301) 261-1984

MI Lowell-Wendt Marketing Co.  
Livonia.....(313) 464-2722

MN Micro Resources  
Minneapolis.....(612) 830-1454

MO The Beams Co.  
St. Louis.....(314) 569-1060

NH Bells Controls  
Nashua.....(603) 882-6984

NJ Gebhardt Marketing  
Springfield.....(201) 376-4415

NY Gebhardt Marketing  
East Islip.....(516) 582-3215

PDQ Associates  
New Hartford.....(315) 768-8167

NC Remco  
Raleigh.....(919) 847-5079

OH Geotronics  
Cleveland.....(216) 526-2535

Columbus.....(614) 457-8472

OR Northwest Marketing  
Portland.....(503) 297-2581

PA Monument Technical Assoc.  
Jenkintown.....(215) 884-3737

TX Acudata  
Houston.....(713) 488-8195

Spring.....(713) 350-1771

Plano.....(214) 424-3567

WA Northwest Marketing  
Bellevue.....(206) 455-5846

WI Prairie Associates  
Waukesha.....(414) 544-1141

Electro-Space Fabricators, Inc.

West High Street  
Topton, PA 19562.....(215) 682-7181

Marketing Manager: Tom Roth

## Sales Representatives:

CA Vale Electronic Associates  
Tustin.....(714) 731-7111

CO Grimes Marketing  
Denver.....(303) 759-8969

CT Betronic Associates  
Bridgeport.....(203) 374-6404

FL Jack Krutek & Associates  
Lighthouse Point.....(305) 941-6544

Orlando.....(303) 898-5998

IL Raines & Associates  
Northbrook.....(312) 498-0890

MD Imagitron Sales  
Pikesville.....(301) 521-2020

MA Betronic Associates  
Waltham.....(617) 894-8400

MN Northport Engineering  
Bloomington.....(612) 854-5556

NJ Winter Associates  
Boonton.....(201) 334-3434

NY Miles M. Burke Associates  
West Winfield.....(315) 822-5916

OH J.R. Bright Agency  
Galion.....(419) 468-3787

OK Advance Technical Sales  
Tulsa.....(918) 743-8517

PA Monteiro Associates  
King of Prussia.....(215) 265-0634

Sistemco  
Pittsburgh.....(412) 761-1124

Dallas.....(214) 361-8584

Houston.....(713) 440-3888

Austin.....(512) 459-1351

WA Electronic Sales N.W.  
Auburn.....

EMM/Sesco

P.O. Box 668  
Chatsworth, CA 91311.....(213)998-9090  
TELEX: 69-1404

ETI Micro

6918 Sierra Court  
Dublin, CA 94566.....(415)829-6600

Sales Contact: Alan R. Daniels

## Sales Representatives:

AL Pen-Tech  
Huntsville.....(205)881-9298

CA Applied Micro Technology  
Woodland Hills.....(213)888-2027  
Sunnyvale.....(408)730-1289

CO Westek  
Lakewood.....(303)989-1900

CT J. Redding & Associates, Inc.  
Sandy Hook.....(203)426-6736

FL Pen-Tech Associates  
Casselberry.....(305)645-3444  
Deerfield Beach.....(305)421-4989

GA Pen-Tech Associates  
Marietta.....(404)424-1931

MD Rep-Troy, Inc.  
Baltimore.....(301)799-7490

MA J. Redding & Associates, Inc.  
Northport.....(516)754-2130

NM BFA Corporation  
Albuquerque.....(505)292-1212

NC Pen-Tech  
High Point.....(919)883-9125

MN Jen-Ray Systems  
Minneapolis.....(612)831-5060

## ETI Micro (Continued)

OH Applied Data Management  
Cincinnati.....(513)579-8108

OR Tasco  
Portland.....(503)245-8168

PA Monument Technical Associates  
Jenkintown.....(215)884-3737

TX Acudata, Inc.  
Houston.....(713)488-8195  
(713)350-1771  
Plano.....(214)424-3567

UT Westek  
Salt Lake City.....(801)582-1200

WA Tasco  
Bellevue.....(206)453-1414

Excelan

2180 Fortune Dr.  
San Jose, CA 95131.....(408)945-9526

Fairchild Camera and Instrument

3420 Central Expressway  
Santa Clara, CA 95051.....(408-773-2101

Forward Technology Incorporated

2175 Martin Ave.  
Santa Clara, CA 95050.....(408)988-2378

Sales Contact: Paul Ray

Garry Manufacturing Company

9 Queen Anne Court  
Langhorne, PA 19047.....(215)943-5220

General Digital Corporation

700 Burnside Ave.

East Hartford, CT 06108.....(203) 528-9041

President: Dr. Russell A. Reiss

Sales Contact: Stuart H. Hoffer

## Sales Representatives:

CA Qualtech Associates

Palo Alto.....(415) 494-9060

## INTERNATIONAL

Intermark International

Concord, MA.....(617) 369-5823

General Electric Company

1800 Volusia

Daytona Beach, FL 32015.....(904) 258-2496

GIC Systems

250 Glenwood Ave.

Bloomfield, NJ 07003.....(201) 743-6800

Sales Contact: Jack Silance

## Sales Representatives:

AL Conley &amp; Associates

Huntsville.....(205) 882-0316

AZ Cleveland Enterprises, Inc.

Phoenix.....(602) 944-4679

CA Maxim Electronic Sales

Santa Clara.....(408) 727-0694

Astralonics

Ventura.....(805) 653-5991  
(213) 991-3602

Manhattan Beach.....(714) 760-6791

Escondido.....(619) 480-8585

Marine Peninsula.....(213) 396-7401

La Canada.....(213) 790-3939

Fullerton.....(714) 680-6906

CO Waugaman Associates, Inc.

Wheatridge.....(303) 423-1012

CT R. F. Duffy Associates

Orange.....(203) 795-3678

## GIC Systems (Continued)

FL Conley &amp; Associates

Oviedo.....(306) 365-3283

Tampa.....(813) 885-7658

Boca Raton.....(305) 395-6108

GA Conley &amp; Associates

Doraville.....(404) 447-6992

IL Momak Sales

Downers Grove.....(312) 963-6400

IN Wilson Technical Sales

Indianapolis.....(317) 259-4032

IA Rep Associates, Inc.

Grand Rapids.....(319) 393-0213

KS Web Electronics

Overlook Park.....(913) 381-2225

MD Beacon North, Inc.

Randallstown.....(301) 655-2265

Parkville.....(301) 882-2056

Mt. Airy.....(703) 534-7200

MA R. F. Duffy Associates

Braintree.....(617) 848-3550

MI Favco, Inc.

Birmingham.....(313) 644-0173

MN Comprehensive Technical Sales

Minneapolis.....(612) 888-7011

MO Web Electronics

Florissant.....(314) 921-5720

NM Cleveland Enterprises

Albuquerque.....(505) 265-7893

NY Mos Associates

Great Neck.....(516) 487-3966

Noeth-Honsinger

Pittsford.....(716) 586-9002

Binghamton.....(607) 724-4865

NC Conley &amp; Associates

Raleigh.....(919) 876-9862



## GIC Systems (Continued)

OH Arthur H. Baier Co.  
Cleveland.....(216) 461-6161  
Dayton.....(513) 276-4128

OK Advance Technical Sales  
Tulsa.....(918) 664-0482

OR Micro Sales, Inc.  
Portland.....(503) 297-4726

TN Conley & Associates  
Greenville.....(615) 639-3139

TX Advance Technical Sales  
Dallas.....(214) 340-1300  
Austin.....(512) 459-1351  
Houston.....(713) 440-3888

UT Waugaman Associates  
Salt Lake City.....(801) 467-4263

VA Beacon North, Inc.  
Falls Church.....(703) 534-7200  
Lynchburg.....(804) 239-8486

WA Micro Sales, Inc.  
Bellevue.....(206) 451-0568  
Liberty Lake.....(509) 255-9122

WI Momak Sales  
Milwaukee, WI.....(414) 963-1590

## CANADA

Norgay Enterprises, Ltd.  
Toronto, Ontario.....(416) 239-3025  
Scottstown, Quebec.....(819) 657-4529

Graphix Development Laboratories

333 Cobalt Way, Suite 106  
Sunnyvale, CA 94086.....(408) 980-7135

Hal-Versa Engineering, Inc.

18597 Paseo Tierra  
Saratoga, CA 95070.....(408) 374-2953

President: Howard Halverson

Heurikon Corporation

3001 Latham Drive  
Madison, WI 53713.....(608) 271-8700  
(800) 356-9602

Sales Contact: Christopher Priebe

## Sales Representatives:

CA Qualtech Associates  
Los Angeles.....(213) 410-0477

Mesa Engineering  
San Diego.....(619) 278-8021

Qualtech Associates  
Palo Alto.....(415) 494-9060

GA Magaro and Associates  
Atlanta.....(404) 252-6609

MA Daner-Hayes, Inc.  
Waltham.....(617) 894-7290

NC Peter Byrne  
Greensboro.....(919) 294-4783

OH Applied Data Management  
Cincinnati.....(513) 579-8108

TX Acudata  
Houston.....(713) 488-8195

Dallas.....(214) 424-3567

UT PAR Associates  
Centerville.....(801) 292-8145

WI Prairie Associates  
Waukesha.....(414) 544-1141

HYBRICON CORPORATION

Hybricon Corp.

410 Great Road

Littleton, MA 01460.....(617)486-3174

President: C. Michael Hayward

Sales Contact: Richard W. Palmer

Sales Representatives

AL Pen-Tech Associates  
Huntsville.....(205)881-9298

CA Basic Systems Corp.  
Santa Clara.....(408)727-1800

Inglewood, Stocking Rep. ..(213)673-4300

San Diego.....(619)268-8000

FL Northern  
Pen-Tech Associates  
Casselberry.....(305)645-3444

Southern  
Pen-Tech Associates  
Deerfield Beach.....(305)421-4989

GA Pen-Tech Associates  
Marietta.....(404)424-1931

IL H. Benjamin Associates  
Glencoe.....(312)835-0150

MD Atlantic Technical Sales  
Churchville.....(301)879-2236

MN Bohlig & Associates  
Minneapolis.....(612)922-7011

NH Electronic Marketing Assoc.  
Salem.....(603)893-5378

NY Upstate NY  
Precision Sales  
Liverpool.....(315)451-3480

Precision Sales  
Pittsford.....(716)381-2820

Precision Sales  
Binghampton.....(607)648-8833

OH Applied Data Management  
Cincinnati.....(513)529-8208

TX Jim D. Gray Assoc. Inc.  
Dallas.....(214)341-7190

CANADA

Transduction Limited

Toronto.....(416)625-1907

Ikier Technology, Inc.

7 Oak Park

Bedford, MA 01730.....(617)275-4330

CA Ikier Technology, Inc.

Thousand Oaks.....(805)496-5854

Pacific Computer Marketing

San Pedro.....(213)519-0679

(213)889-2532

Zytronics

Santa Clara.....(408)730-1263

IL Ad Tech, Inc.

Park Ridge.....(312)692-7320

MA J. Redding Assoc.

Acton.....(617)263-8206

OR Electronic Tech. Sales

Hillsboro.....(503)640-8086

TX SCI Sales, Inc.

Dallas.....(214)931-1487

Houston.....(713)664-1543

VA Dynarep

Alexandria.....(703)354-1222

WA Electronic Tech. Sales

Kirkland.....(206)827-8086

CHINA

Robin Information Systems

Hong Kong.....852-5-891-5313

TLX: 63594 RISHK HX

SINGAPORE

Robin Information Systems

Singapore.....65-273-5588

TLX: RS35732 RIS

WEST GERMANY

Dipl. Ing. D. Sommer

Frankfurt.....49-611-558-662

TLX: 0414587 DAS

ENGLAND

Measurement Systems Ltd.

Barkshire.....44-0635-45420

INTERNATIONAL

W.R. Magnus

Chicago.....(312)263-6124

Ikon Corporation  
2617 Western Ave.  
Seattle, WA 98121.....(206)634-3410

Sales Contact: Bruce A. Bradburn

Imaging Technology, Inc.  
400 West Cummings Park, Ste.4350  
Woburn, MA 01801.....(617)938-8444

#### WEST GERMANY

Stemmer Elektronik  
Puchheim.....(089)80-60-61  
Telex: 05216425 STELD

#### FRANCE

Tekelec Airtronic  
Sevres.....(1)534-75-35  
Telex: 204 552 TKLEC

#### ENGLAND

Data Translations Ltd.  
Slough, Berks.....011-44-6286-3412  
Telex: 851-849862 DATA G

#### JAPAN

ASR Corporation International  
Tokyo.....03-437-5371  
Telex: 0242-2723

#### ISRAEL

R.N. Electronics  
Tel-Aviv.....(03)79-69-27  
Telex: 342107 RNIS.....(03)70-81-74-5

Industrial Micro Applications, Inc.  
P. O. Box 270358  
Houston, TX 77277.....(713)488-1171

Sales Contact: Bob Watts

Information Development & Applications, Inc.  
10759 Tucker Street  
Beltsville, MD 20705.....(301)937-3600

Product Manager: Frank Giuffre

Intel Corporation  
5200 N. E. Elam Young Parkway  
Hillsboro, OR 97123.....(503)640-7147

OMO Marketing Manager: Barbara Slaughter

#### Sales Representatives:

AL Intel Corp.  
Huntsville.....(205)533-9353

AZ Intel Corp.  
Phoenix.....(602)869-4980

CA Intel Corp.  
San Diego.....(714)268-3563

Santa Ana.....(714)835-9642

Tarzana.....(213)708-0333

Santa Clara.....(408)987-8086

Earl Associates  
San Diego.....(714)278-5441

Mac-I  
Berkeley.....(415)843-7625

Milpitas.....(408)946-8885

Fountain Valley.....(714)839-3341

Santa Monica.....(213)452-7611

Woodland Hills.....(213)347-5900

CO Intel Corp.  
Denver.....(303)321-8086

CT Intel Corp.  
Danbury.....(203)792-8366

EMC Corp.  
Manchester.....(203)646-8085

FL Intel Corp.  
Ft. Lauderdale.....(305)771-0600

Maitland.....(305)628-2393

GA Intel Corp.  
Norcross.....(404)449-0541

IL Intel Corp.  
Rolling Meadows.....(312)981-7200

IN Intel Corp.  
Indianapolis.....(317)875-0623

IA Intel Corp.  
Cedar Rapids.....(319)393-5510

## Intel Corporation (Continued)

KS Intel Corp.  
Overland Park.....(913) 642-8080

MD Intel Corp.  
Hanover.....(301) 796-7500

MA Intel Corp.  
Chelmsford.....(617) 256-1800

EMC Corp.  
Newton.....(617) 244-4740

MI Intel Corp.  
Southfield.....(313) 353-0920

MN Intel Corp.  
Edina.....(612) 835-6722

MO Intel Corp.  
Earth City.....(314) 291-1990

NJ Intel Corp.  
Edison.....(201) 225-3000

NM BFA Corporation  
Las Cruces.....(505) 523-0601

Albuquerque.....(505) 292-1212

NY Intel Corp.  
Hauppauge.....(516) 231-3300

Poughkeepsie.....(914) 473-2303

Rochester.....(716) 424-1050

T-Squared  
Syracuse.....(315) 463-8592

Victor.....(716) 924-9101

NC Intel Corp.  
Greensboro.....(919) 294-1541

OH Intel Corp.  
Dayton.....(513) 890-5350

Cleveland.....(216) 464-2736

OK Intel Corp.  
Tulsa.....(918) 744-8068

OR Intel Corp.  
Beaverton.....(503) 641-8086

PA Intel Corp.  
Fort Washington.....(215) 641-1000

Pittsburgh.....(412) 823-4970

Q.E.D. Electronics  
Hatboro.....(215) 674-9600

## Intel Corporation (Continued)

TX Intel Corp.  
Dallas.....(214) 241-8087

Houston.....(713) 784-3400

Industrial Digital Systems Corp.  
Houston.....(713) 988-9421

Intel Corp.  
Austin.....(512) 454-3628

UT Intel Corp.  
Bountiful.....(801) 292-2164

Salt Lake City.....(801) 533-8086

VA Intel Corp.  
Richmond.....(804) 282-5668

WA Intel Corp.  
Bellevue.....(206) 453-8086

WI Intel Corp.  
Brookfield.....(414) 784-9080

Interlan, Inc.  
160 Turnpike Road  
Chelmsford, MA 01824.....(617) 256-5888

V. P. Marketing: Patrick L. Clark



Interphase Corporation

13667 Floyd Circle  
Dallas, TX 75243.....(214)238-0971

O.E.M. Product Manager: Bobby Walker

Sales Representatives:

AL Pen-Tech Associates, Inc.  
Huntsville.....(205)881-9298

AZ Peripherals, Inc.  
Phoenix.....(602)242-7800

CA Qualtech Associates  
Orange.....(714)639-9820

No. Hollywood.....(213)765-1419

San Diego.....(619)274-8580

FL Pen-Tech Associates  
Casselberry.....(305)645-3444

Deerfield Beach.....(305)421-4989

GA Pen-Tech Associates, Inc.  
Marietta.....(404)424-1931

IL Adtech  
Park Ridge.....(312)692-7320

IA T.R.I.  
Cedar Rapids.....(319)303-1200

KS T.R.I.  
Wichita.....(316)681-0242

MD Spectro Associates  
Rockville.....(301)279-2010

MA R. D. Stout  
Acton.....(617)263-1128

MO T.R.I.  
Earth City.....(314)291-0001

Kansas City.....(816)756-3575

NB T.R.I.  
Lincoln.....(402)475-2115

NM Peripherals  
Albuquerque.....(505)848-9170

NC Pen-Tech Associates, Inc.  
Greensboro.....(919)852-6000

Interphase Corporation (Continued)

OH Applied Data Management  
Cincinnati.....(513)579-8108

OR E.T.S.  
Hillsboro.....(503)640-8086

PA Technico  
Trevose.....(215)245-8411

TX Digital Solutions  
Dallas.....(214)980-1984

Austin.....(512)451-0755

Houston.....(713)988-9733

WA E.T.S.  
Kirkland.....(206)827-8086

Intersil Systems, Inc.

1275 Hammerwood Ave.  
Sunnyvale, CA 94086.....(408)743-4442

Sales Representatives:

AL Cartwright & Bean, Inc.  
Huntsville.....(205)830-1540

AZ Computer Peripheral Sales  
Glendale.....(602)241-6361

CA A-F Sales Engineering  
Pasadena.....(213)681-5631

Orange County.....(714)641-2903

San Diego.....(619)226-8424

Covington Sales Co.  
Berkeley.....(415)547-2516

Intersil Systems, Inc. (Continued)

CA Mesa Engineering, Inc.  
San Diego.....(714) 278-8021

Micro Technology Sales  
Irvine.....(714) 545-6993

CO Cleveland Enterprises, Inc.  
Denver.....(303) 751-3252

CT HLM Associates, Inc.  
Waterbury.....(203) 753-9894

FL Southern Engineering Assoc.  
St. Petersburg.....(813) 577-7700

GA Cartwright & Bean, Inc.  
Atlanta.....(404) 233-2939

IL Micro-Tex  
Schaumburg.....(312) 885-1131

IN Giesting & Associates  
Indianapolis.....(317) 263-0005

Fort Wayne.....(219) 486-1912

IA Dy Tronix, Inc.  
Cedar Rapids.....(319) 377-8275

KS Ramsey Associates, Inc.  
Overland Park.....(913) 649-6996

MD New Era Sales  
Severna Park.....(301) 544-4100

MA Com-Sale  
Waltham.....(617) 890-0011

MI Giesting & Associates  
Northville.....(313) 348-3811

Coloma.....(616) 468-4200

MO Ramsey Associates, Inc.  
Maryland Heights.....(314) 878-5042

NH Com-Sale  
Manchester.....(603) 668-1440

NJ HLM Associates  
Parsippany.....(201) 263-1535

Com-Tek  
Mount Laurel.....(609) 235-8505

NM Computer Peripheral Sales, Inc.  
Albuquerque.....(505) 345-8756

Intersil Systems, Inc. (Continued)

NY Ossmann Component Sales Corp.  
Rochester.....(716) 424-4460

Syracuse.....(315) 455-6611

HLM Associates  
Northport.....(516) 757-1606

NC Cartwright & Bean, Inc.  
Charlotte.....(704) 377-5673

Raleigh.....(919) 781-6560

OH Giesting & Associates  
Cincinnati.....(513) 521-8800

Euclid.....(216) 431-4241

Dayton.....(513) 293-4044

Galion.....(419) 468-3737

OR Olson Ferree & Associates, Inc.  
Hillsboro.....(503) 640-9660

PA Giesting & Associates  
Hopwood.....(412) 438-2336

TX Technical Marketing, Inc.  
Austin.....(512) 835-0064

Carrollton.....(214) 387-3601

Houston.....(713) 777-9228

UT Cleveland Enterprises, Inc.  
Salt Lake City.....(801) 355-8424

WA Olson Ferree & Associates, Inc.  
Bellevue.....(206) 883-7792

WI Micro-Tex, Inc.  
Waukesha.....(414) 542-5352

CANADA

Gidden-Morton Assoc., Inc.  
Brampton, Ontario.....(416) 846-4610

Mississauga, Ontario.....

Specific Instruments, Ltd.  
Burnaby, B.C. ....(604) 291-6911

Inventive Systems, Inc.

P.O. Box 220  
Lexington Park, MD 20653.....(301)863-5153

j & h Manufacturing, Inc.

6120 31st Ave. N.E.  
Marysville, WA 98270.....(206)653-4571

Jonos Ltd.

920-C E. Orangethorpe  
Anaheim, CA 92801.....(714)871-1082

Konan Corporation

1448 N. 27th Ave.  
Phoenix, AZ 85009.....(602)269-2649

Sales Contact: Pamela Cannon  
Dan Vasquez

LeCroy Research Systems Corporation

700 South Main Street  
Spring Valley, NY 10977.....(914)425-2000

Linear Systems, Ltd.

1122 Sanford St.  
Winnipeg, Manitoba  
Canada R3E 2Z9.....(204)774-7991

CA Industrial Modules, Inc.  
Santa Clara.....(408)988-1911

Logitech, Inc.

165 University Avenue  
Palo Alto, CA 94301.....(415)326-3885

Sales Contact: Pierluigi Zappacosta

INTERNATIONALSwitzerland

Logitech SA  
Apples.....(021)773136  
TELEX: 458217

Italy

Logitech Srl  
Ivrea.....(0125)424541  
TELEX: 210619 ATTN: Logi

Marinco, Inc.

11760 Sorrento Valley Rd. Ste. J  
San Diego, CA 92121.....(619)453-5203

Matrox Electronic Systems, Ltd.

5800 Andover Avenue  
T.M.R. Quebec  
Canada H4T 1H4.....(514)735-1182  
TELEX: 05-825651

AL Pen-Tech Associates  
Huntsville.....(205)881-9298

AZ P.A.R. Associates  
Phoenix.....(602)243-4267

CA Industrial Modules Inc.  
Santa Clara.....(408)988-1911

CO P.A.R. Associates  
Denver.....(303)371-4140

FL Pen-Tech Associates  
Casselberry.....(305)645-3444  
Deerfield Beach.....(305)421-4989

GA Pen-Tech Associates  
Marietta.....(404)424-1931

IA Technical Representatives Inc.  
Cedar Rapids.....(319)364-8650

KS Technical Representatives Inc.  
Wichita.....(316)681-0242

MD Burgin-Kreh Associates  
Baltimore.....(301)265-8500

MA Nova Sales Inc.  
Lexington.....(617)861-1820

MN Jen-Ray Systems  
Minneapolis.....(612)831-5060

MO Technical Representatives Inc.  
Earth City.....(314)291-0001

Kansas City.....(816)756-3575

NE Technical Representatives Inc.  
Lincoln.....(402)475-2115

NJ ABC Electronic Sales Co.  
Franklin.....(201)827-9716

NY ABC Electronic Sales Co.  
Pleasantville.....(914)796-8088

Williston Park.....(516)747-6610

KLM Garner  
Clark Mills.....(315)853-6126

N. Syracuse.....(315)458-6214

Pittsford.....(716)381-8350

NC Burgin-Kreh Associates  
Raleigh.....(919)781-1100

Matrox Electronic Systems, Ltd. (Continued)

OR Westerberg & Associates  
Portland.....(503)297-1719

PA Knowles Associates  
Huntingdon Valley.....(215)947-5641

TX Mycrosystems Marketing  
Austin.....(512)452-2842

Richardson.....(214)669-2380

Stafford.....(713)491-6550

UT P.A.R. Associates  
Centerville.....(801)292-8145

VA Burgin-Kreh Associates  
Lynchburg.....(804)239-2626

WA Westerberg & Associates  
Bellevue.....(206)453-8881

INTERNATIONAL

Australia  
Measuring & Control Equipment Co.  
Australia.....68-4060  
TLX: 22922 POSSY

Austria  
Bacher Elektronische Gerate GES MBH  
Austria.....(0220)835646-0  
TLX: 131532 BASAT

Denmark  
Jorgen Anderson Ingeniorfirma A.S.  
Denmark.....(02)91-88-88  
TLX: 35378 JORGEX

England  
Perdix Components  
London.....01-690-1914/5  
TLX: 897883 PERDIX

Finland  
OY Fintronic AB  
Helsinki.....  
TLX: 124224 FTRON

France  
Metrologie  
France.....791-44-44  
TLX: 611448 METROLO

Greece  
American Technical Enterprises S.A.  
Athens.....8219-470-8811-271  
TLX: 216046 ATE

Holland  
Matrox Benelux  
Holland.....3456741  
TLX: 76159 MATRX

Israel  
E.I.M. International Electronics Ltd.  
Israel.....(03)744-041

Matrox Electronic Systems, Ltd. (Continued)

Israel  
E.I.M. International Electronics Ltd.  
Israel.....(03)744-041  
TLX: 342362 EIM

Italy  
3G Electronics S.R.L.  
Milano.....5466367/543096  
TLX: 321024 TREGMI

Japan  
Internix Incorporated  
Tokyo.....(03)369-1101  
TLX: 26733 INTERNX

New Zealand  
G.T.S. Engineering Ltd.  
Auckland  
TLX: NZ 60430

Norway  
Nordisk Electronik (Norge) A/S  
TLX: 17546 NENAS

Portugal  
Ditram Componentes e Electronica Lta  
TLX: 14182 BRICKS

Spain  
Unitronics S.A.  
Madrid.....242-52-04  
TLX: 46786 UTRON

Sweeden  
Micro Scandia Industriaautomation AB  
TLX: 32685 MICRO

Switzerland  
Relais-Rohr  
Zurich.....(01)301-09-70  
TLX: 58587 ROHR CH

Taiwan  
Multitech International Corp.  
Taipei.....(02)7681232  
TLX: 23756

West Germany  
Ernst Rauscher Systemberatung  
Munchen.....089-878061  
TLX: 5212504 RASY

MBI, Incorporated  
31 Williams Street  
Newton Upper Falls, MA 02164.....(617)964-1399

Marketing Manager: Reed M. Smith

MDB Systems, Inc.  
1995 N. Batavia Street  
Orange, CA 92665.....(714)998-6900



Medinova Corporation

306 Campus Dr.  
Arlington Heights, IL 60004.....(312)870-0855

Sales Contact: Tom Burdick

## Sales Representatives:

IL ICM Industrial Sales Div.  
Palatine.....(312)934-4700

Megalogic Corporation

9659 National Road  
Brookville, OH 45309.....(513)833-5222

MESA Technology Corporation

16021 Industrial Dr.  
Gaithersburg, MD 20877.....(301)948-4612  
TWX: 710-828-9702

## Sales Representatives:

CA Beckrep  
LaCresento.....(213)957-1111

Metacomp, Inc.

7290 Engineer Road, Ste. F  
San Diego, CA 92111.....(619)571-1168

Sales Contact: Gwynneth Stegen

## Sales Representatives:

CA MAC-i  
Fountain Valley.....(714)839-3341  
Milpitas.....(408)946-8885  
Woodland Hills.....(213)347-5900  
Mesa Engineering  
San Diego.....(619)278-8021  
IL Momak Sales  
Downers Grove.....(312)963-6400  
MD SIMCOMP  
Gaithersburg.....(301)258-9358  
MN Micro Resources, Inc.  
Minneapolis.....(612)830-1454  
MA J. Redding Associates  
Acton.....(617)263-8206  
NY J. Redding Associates  
North Port.....(516)754-2130

## Metacomp, Inc. (Continued)

OR Electronics Technical Sales  
Hillsboro.....(503)640-8086

PA Monument Technical Associates  
Jenkintown.....(215)884-3737

TX Microsystems Marketing  
Austin.....(512)452-2842

Dallas.....(214)669-2380

Houston.....(713)491-6550

WA Electronics Technical Sales  
Kirkland.....(206)827-8086

WI MOMAK  
Milwaukee.....(414)963-1276

## INTERNATIONAL

## France

Tekelec Airtronics  
Paris.....(1) 534.75.35

## West Germany

Tekelec Airtronics  
Munchen .....(089) 594621

Methode Electronics, Inc.

7444 W. Wilson Avenue  
Chicago, IL 60656.....(312)867-9600  
TWX: 910221-2468

Micomp Development Corporation

P.O. Box 386  
Whippany, NJ 07981.....(201)386-9785

Microbar Systems, Inc.

1120 San Antonio Road  
Palo Alto, CA 94303.....(415)964-2862

President: Rich Boberg

Sales Representatives:

AZ Peripherals Inc.  
Phoenix.....(602)242-7800

AL Pen-Tech Associates, Inc.  
Huntsville.....(205)881-9289

CA Qualtech Associates  
Palo Alto.....(415)494-9060  
Los Angeles.....(213)765-1419  
Orange.....(714)639-9820

FL Pen-Tech Associates  
Deerfield Beach.....(305)421-4989  
Maitland.....(305)645-3444

GA Pen-Tech Associates, Inc.  
Marietta.....(404)424-1931

MD Robert Electronic Sales  
Catonsville.....(301)788-2380

MA J. Redding Associates  
Acton.....(617)263-8206

MN Micro Resources, Inc.  
Minneapolis.....(612)830-1454

NM Peripherals Inc.  
Albuquerque.....(602)242-7800

NY J. Redding Associates  
Rochester.....(716)442-8520

NC Pen-Tech Associates, Inc.  
High Point.....(919)852-6000

OH Applied Data Management, Inc.  
Cincinnati.....(513)579-8108

OR Westerberg & Associates  
Boring.....(503)292-1719

PA Monument Technical Associates, Inc.  
Jenkintown.....(215)884-3737

Microbar Systems, Inc. (Continued)

TX Mycosystems Marketing  
Austin.....(512)452-2842  
Dallas.....(214)238-7157  
Richardson.....(214)669-2380  
Stafford.....(713)491-6550

WA Westerberg & Associates  
Bellevue.....(206)453-8881

CANADA

Transduction.....(416)625-1907

INTERNATIONAL

England

ISG Data Sales Ltd.  
England.....(7535)57955

Microcomputer Systems Corporation

432 Lakeside Drive  
Sunnyvale, CA 94086.....(408)733-4200

Micro Digital Associates

3435 Cerritos Avenue  
Los Alamitos, CA 90720.....(714)891-2363

Micrographics Research

28 Pioneer Drive  
Nashua, NH 03062.....(603)888-6790

Micro Industries

691 Greencrest Dr.  
Westerville, OH 43081.....(614)895-0404

Micromation Incorporated

1620 Montgomery Street  
San Francisco, CA 94111.....(415)398-0289

Micro Memory, Inc.

9434 Irondale Ave.  
Chatsworth, CA 91311.....(213)998-0070

Micro/Sys, Inc.

1367 Foothill Blvd.  
La Canada, CA 91011.....(213)790-7267

Sales Contact: Ken Finster

Midwest Micro-Tek, Inc.  
5930 Brooklyn Blvd.  
Brooklyn Center, MN 55429.....(612)560-6530

Mobius Engineering  
4869 Topanga Canyon Blvd., Ste 7  
Woodland Hills, CA 91364.....(213)716-6698

Monolithic Systems Corp.  
84 Inverness Circle East  
Englewood, CO 80112.....(303)770-7400

Sales Contact: Dan Meinerz

Morrow Computer & Electronic Design, Inc.  
1140 Murfreesboro Road  
Nashville, TN 37217.....(615)366-1979

Sales Contact: Gary Sullivan

Motorola Semiconductor Products, Inc.  
A Subsidiary of Motorola Inc.  
3501 Ed Bluestein Blvd.  
Austin, TX 78721.....

Mupac Corporation  
10 Mupac Drive  
Brockton, MA 02401.....(617)588-6110

Sales Representatives:

AL Currie, Peak & Frazier  
Huntsville.....(205)536-1506

AZ Trembly Associates  
Tempe.....(602)967-2058

CA DC Electronics  
Santa Clara.....(408)980-1199

Cerco  
San Diego.....(619)560-9143

Mupac Corp.  
Tustin.....(714)271-1121

CO Trembly Associates  
Lakewood.....(303)233-9544

FL Currie, Peak & Frazier  
Orlando.....(305)855-0843

GA Currie, Peak & Frazier  
Duluth.....(404)476-3107

IL Engineered Sales Company  
Addison.....(312)832-8425

IN Hoyle Associates  
Ft. Wayne.....(219)485-6433

Mupac Corporation (Continued)

MD Rep-Tron, Inc.  
Baltimore.....(301)799-7490

MI Micro Sales Corporation  
Northville.....(313)459-1670

MN Loren Green Associates  
Minneapolis.....(612)571-6738

MO Chesco  
St. Charles.....(314)946-6677

Blue Springs.....(816)229-1404

NM Grady Moore Associates  
Albuquerque.....(505)262-1416

NY F & F Associates  
Glen Cove.....(516)671-8900

Labtronics, Inc.  
Syracuse.....(315)455-7314

NV Trembly Associates  
Las Vegas.....(702)369-8700

NC Currie, Peak & Frazier  
Greensboro.....(919)373-0380

OH Micro Sales Corporation  
Dayton.....(513)433-8171

No. Olmsted.....(216)734-3080

PA Micro Sales Corporation  
Pittsburgh.....(412)928-8118

RJI  
King of Prussia.....(215)265-5211

SC Currie, Peak & Frazier  
Columbia.....(803)254-1971

TX Lear Associates, Inc.  
Richardson.....(214)231-5388

Spring.....(713)370-7449

UT Trembly Associates  
Salt Lake City.....(801)486-5292

WA Comtec  
Bellevue.....(206)453-1188

National Instruments  
12109 Technology Blvd.  
Austin, TX 78759.....(512)250-9119

National Semiconductor Corporation

2900 Semiconductor Drive  
Santa Clara, CA 95051.....(408) 721-4671

## Sales Representatives:

AL New Interep Associates  
Huntsville.....(205) 533-1730

AZ National Semiconductor  
Scottsdale.....(602) 945-8473

Fred Board Associates  
Scottsdale.....(602) 994-9388

CA National Semiconductor  
Santa Clara.....(408) 274-6397

Sherman Oaks.....(213) 995-8335

Irvine.....(714) 957-1626

San Diego.....(714) 560-8330

Bay Tech Sales  
Santa Clara.....(408) 727-9404

Great American Rep Company  
Sherman Oaks.....(213) 990-4870

Tustin.....(714) 832-8113

S.R. Electronics  
San Diego.....(714) 560-8330

CO National Semiconductor  
Denver.....(303) 752-1894

Monaghan Sales Associates  
Denver.....(303) 695-7770

CT National Semiconductor  
Wilton.....(203) 762-0378

NRG Limited  
Westport.....(203) 226-7527

FL National Semiconductor  
Miami.....(305) 949-3162

QXI  
Altamont Springs.....(305) 331-0341

St. Petersburg.....(813) 821-2281

Tamarac.....(305) 485-6030

GA National Semiconductor  
Atlanta.....(404) 393-2626

Action Component Sales  
Atlanta.....(404) 393-9494

IL National Semiconductor  
Schaumburg.....(312) 397-8777

Delta Technical Sales  
Arlington Heights.....(312) 253-9440

## National Semiconductor Corporation (Continued)

IN National Semiconductor  
Indianapolis.....(317) 842-5006

Advanced Component Sales  
Indianapolis.....(317) 545-6441

Fort Wayne.....(219) 484-0722

IA Stan Clothier Company  
Cedar Rapids.....(319) 395-0245

KY Advanced Component Sales  
Louisville.....(502) 459-9895

MD National Semiconductor  
Columbia.....(301) 995-0820

Trimark  
Glen Burnie.....(301) 768-2800

MA National Semiconductor  
Lexington.....(617) 861-6520

A/D Systems Sales, Inc.  
Lexington.....(617) 861-6371

MI National Semiconductor  
Farmington Hills.....(313) 553-0600

Representatives of Electronic Products  
Southfield.....(313) 559-1080

Grand Rapids.....(616) 942-1320

MN National Semiconductor  
Minneapolis.....(612) 888-3060

Stan Clothier Co.  
Minneapolis.....(612) 944-3436

MO National Semiconductor  
Kansas City.....(816) 931-9600

Cen Tech  
Baytown.....(816) 358-8100

Earth City.....(314) 291-4230

NJ National Semiconductor  
Paramus.....(201) 967-5300

Northeast Components Corporation  
Franklin Lakes.....(201) 891-6520

NM Reptronix, Inc.  
Albuquerque.....(505) 881-8001

NY National Semiconductor  
Syracuse.....(315) 463-8047

Electra Sales Corp.  
Syracuse.....(315) 463-1248

Rochester.....(716) 424-6280

National Semiconductor Corporation (Continued)

NY National Semiconductor  
Poughkeepsie.....(914)462-2380  
  
Regional Office.....(516)222-1543  
  
Parallax Sales  
Melville.....(516)694-9090  
  
NC Engineering Devices Corporation  
Cary.....(919)469-9323  
  
OH National Semiconductor  
Highland Heights.....(216)461-0191  
  
Micro-Tec, Inc.  
Highland Heights.....(216)442-1555  
  
Columbus.....(614)888-9761  
  
Miamisburg.....(513)866-0380  
  
OR Micro Sales, Inc.  
Portland.....(503)297-4749  
  
PA National Semiconductor  
Ft. Washington.....(215)643-4910  
  
Omega Electronic Sales, Inc.  
Huntington Valley.....(215)947-4135  
  
Micro-Tec, Inc.  
Pittsburgh.....(216)442-1555  
  
SC Engineering Devices Corporation  
Columbia.....(803)772-3738  
  
TN Action Component Sales  
Knoxville.....(615)690-1172  
  
TX National Semiconductor  
Dallas.....(214)690-4552  
  
Carter Associates  
Garland.....(214)276-7151  
  
Austin.....(512)451-0201  
  
Houston.....(713)789-1680  
  
UT Monaghan Sales Associates  
Salt Lake City.....(801)942-6297  
  
VA Trimark  
Newport News.....(804)874-2325  
  
WA National Semiconductor  
Bellevue.....(206)454-4600  
  
Micro Sales, Inc.  
Bellevue.....(206)451-0568

NCR Corp.  
Independent Marketing Org.  
Dayton, OH 45479.....(513)445-2380

NEC Electronics U.S.A., Inc.

1 Natick Executive Park  
Natick, MA 01760.....(617)655-8833

Sales Contact: Jack Courtemanche  
Marketing Manager

Sales Representatives:

AL 20th Century Marketing Inc.  
Huntsville.....(205)533-9281  
  
AZ Eltron  
Phoenix.....(602)266-2164  
  
CA Cerco  
San Diego.....(714)560-9143  
  
Quorum Technical Sales  
Santa Clara.....(408)980-0812  
  
Santana Sales  
Los Alamitos.....(714)827-9100  
  
CO D/Z Associates  
Denver.....(303)429-9369  
  
CT HLM Associates, Inc.  
Waterbury.....(203)753-9894  
  
FL Semtronics, Inc.  
Altamonte.....(305)831-8233  
  
Clearwater.....(813)461-4675  
  
GA Montgomery Marketing Inc.  
Norcross.....(404)447-6124  
  
IL TA Carroll & Associates  
Schaumburg.....(312)843-1125  
  
IN M/S Sales & Associates, Inc.  
Fort Wayne.....(219)484-1904  
  
Indianapolis.....(317)257-8915  
  
KS Advanced Technical Sales  
Overland Park.....(913)492-4333  
  
MD Professional Representatives  
Baltimore.....(301)653-3600  
  
MI Miltimore Sales, Inc.  
Novi.....(313)349-0260  
  
Grand Rapids.....(616)942-9721  
  
MN Electronic Innovators, Inc.  
Eden Prairie.....(612)941-0830  
  
MO Advanced Technical Sales  
St. Louis.....(314)227-4448



NEC Electronics U.S.A., Inc. (Continued)

NV Quorum Technical Sales  
Reno.....(702)849-2415

NH Computech, Inc.  
Nashua.....(603)883-9380

NJ BGR Associates  
Marlton.....(609)428-2440

HLM Associates, Inc.  
Parsippany.....(201)263-1535

NM Cleveland Enterprises, Inc.  
Albuquerque.....(505)265-7893

NY D. L. Eiss & Associates, Inc.  
Syracuse.....(315)457-0492

Rochester.....(716)328-3000

Kingston.....(914)338-7588

HLM Associates, Inc.  
Northport.....(516)757-1606

NC Montgomery Marketing, Inc.  
Cary.....(919)467-6319

OH Imtech, Inc.  
Akron.....(216)666-1185

Dayton.....(513)278-6507

OR Tasco  
Portland.....(503)245-8168

TN 20th Century Marketing, Inc.  
Knoxville.....(615)966-3608

TX Technical Marketing, Inc.  
Austin.....(512)835-0064

Carrollton.....(214)387-3601

Houston.....(713)777-9228

UT D/Z Associates  
Salt Lake City.....(801)268-2876

WA Tasco  
Bellevue.....(206)453-1414

CANADA

Kaytronics, Ltd.  
Concord, Ontario .....(416)669-2262

Ville St. Pierre, Quebec.....(514)367-0101

Surrey, B.C. ....(604)581-7611

North Coast Automation, Inc.

12768 Chillicothe Road  
Chesterland, OH 44026.....(216)729-2200

Sales Contact: Edward J. Rapp

Sales Representatives:

GA MicroSpec, Inc.  
Lawrenceville.....(404)979-3444

MA Electro Kinetics  
Wellesley.....(617)235-9415

OH Motion Technologies  
Toledo.....(419)885-2723

PA Technico  
Trevose.....(215)245-8411

CANADA

Motion Control Systems, Inc.  
Weston, Ontario.....(416)743-7930

Omnibyte Corporation

245 W. Roosevelt Road, Bldg. I-5  
West Chicago, IL 60185.....(312)231-6880

Sales Contact: Randy Cochran

One/D Corp.

2286 Mora Dr.  
Mountain View, CA 94040.....(415)969-9900

Sales Representative:

AIM Technology.....(408)727-3711

Optima, Scientific Atlanta

2166 Mountain Industrial Blvd.  
Tucker, GA 30084.....(404)939-6340

Opto 22

15461 Springdale St.  
Huntington Beach, CA 92649.....(714)891-5861  
TELEX: 692386

Ormec Systems Corp.

7 Linden Park  
Rochester, NY 14625.....(716)385-3520

Sales Contact: Michael G. Mino

Pacific Microcomputers, Inc.  
119 Aberdeen Drive  
Cardiff, CA 92007.....(619)436-8649

Sales Contact: Stan Skowronski

Sales Representatives:

CA Western Scientific Marketing Inc.  
San Diego.....(619)565-6699

CO RADCO ELECTRONICS  
Littleton.....(303)794-4279

MA Eastmark  
Needham.....(617)449-0050

MD SIMCOMP, INC.  
Gaithersburg.....(301)258-9358

NJ Gebhardt Marketing  
Springfield.....(201)376-4415

OH Swenson Associates  
Dayton.....(513)435-2772

PA Lynbar Group Inc.  
Huntingdon Valley.....(215)947-3554

TX Mid-Southwest Data Systems  
Richardson.....(214)680-2728

WA TASCO  
Bellevue.....(206)453-1414

INTERNATIONAL

England  
Bleasdale Computer Systems  
London.....1-828-6661

Panlmatic Company  
79 Bond St.  
Elk Grove Village, IL 60007.....(312)439-4030

Sales Contact: Bob Froehlich

Phoenix Computer Graphics  
119 Board Road  
P.O. Box 51914  
Lafayette, LA 70503.....(318)234-0063

Sales Contact: Mike Mulligan

Plessey Microsystems  
451 Hungerford Drive  
Rockville, MD 20850.....(301)279-2892  
(800)368-2738

Procise Corporation  
P.O. Box 1011  
Issaquah, WA 98027.....(206)392-0270

Sales Contact: Ron Brooks

Sales Representatives:

FL Delmac Sales, Inc.  
Orlando.....(305)898-4688

Tamarac.....(305)726-1330

Clearwater.....(305)447-5192

X IO Cahill, Schmitz & Cahill, Inc.  
Cedar Rapids.....(319)377-8219

X MI Action Component Sales, Inc.  
Novi.....(313)349-3940

X MN Cahill, Schmitz & Cahill, Inc.  
St. Paul.....(612)646-7217

Proteon Associates, Inc.  
24 Crescent St.  
Waltham, MA 02154.....(617)894-1980

President: Howard Salwen

Sales Representatives:

CO Colorado Computer Cable Co.  
Boulder.....(303)447-9713

IL Physics Equipment  
Downers Grove.....(312)960-4054

TX Data Systems  
Richardson.....(214)669-0382

VA Gans & Pugh Associates, Inc.  
Arlington.....(703)257-3262

Prototek, Inc.  
5705 Springdale Rd.  
Cincinnati, OH 45239.....(513)874-5094

Sales Contact: Becky Shaver

Questor Computer Systems, Inc.  
560 Parrott St.  
San Jose, CA 95112.....(408)286-2866

Raster Graphics

P.O. Box 23334

Tigard, OR 97223.....(503)620-2241

Sales Contact: Phillip Smith

Sales Representatives:

IA The Beams Co.  
Des Moines.....(515)255-1148

KS The Beams Co.  
Shawnee Mission.....(913)631-0300

MO The Beams Co.  
St. Louis.....(314)569-1060

PA Monument Technical Associates  
Jenkintown.....(215)884-3737

INTERNATIONAL

Austria  
Microtek Computersystems....(02242) 8381

Relms

1180 Miraloma Way

Sunnyvale, CA 94086.....(408)732-5520

R & D Electronics (Pty) Ltd.

P.O. Box 61903

Marshalltown

2107 South Africa.....(011)834-1204/5

TELEX: 8-3046 SA

Sales/Marketing: T G Enterprises  
Al Feinstein, Dir. Mktg.

Robotrol Corp.

1250 Oakmead Parkway, Suite 210

Sunnyvale, CA 94086.....(408)732-8813

Sales Representatives:

AL Pen-Tech Associates, Inc.  
Huntsville.....(205)881-9298

CA Knott Engineering  
Santa Ana.....(714)838-9289

FL Pen-Tech Associates, Inc.  
Casselberry.....(305)645-3444

Deerfield Beach.....(305)421-4989

GA Pen-Tech Associates, Inc.  
Marietta.....(404)424-1931

MI Infinity Inc.  
Southfield.....(313)557-7230

Robotrol Corp. (Continued)

NC Pen-Tech Associates, Inc.  
Greensboro.....(919)852-6000

OH Infinity, Inc.  
Bedford Heights.....(216)439-8146

SBE, Inc.

4700 San Pablo Ave.

Emeryville, CA 94608.....(415)652-1805

TWX: 910-366-2116

Sales Representatives:

AZ RLS Instruments  
Phoenix.....(602)892-9329

CT Industro Associates  
Stamford.....(516)487-2620

COM-SALE

Wallingford.....(203)269-7964

FL Dixie Tech. Mktg.  
Longwood.....(305)339-7111

GA Dixie Tech. Mktg.  
Atlanta.....(404)962-2530

IA Beams Company  
Des Moines.....(515)255-1148

IL Prairie Associates  
Chicago.....(215)245-8411

IN Andrew C. Corrao  
Fort Wayne.....(219)483-0579

KS Beams Company  
Kansas City.....(913)631-0300

KY Applied Data Mgmt.  
Lexington.....(513)579-8108

ME COM-SALE  
Portland.....(617)890-0011

MA COM-SALE  
Waltham.....(617)890-0011

MI FAVCO  
Birmingham.....(313)644-0173

Grand Rapids.....(616)459-4425

MO Beams Company  
St. Louis.....(314)569-1060

NH COM-SALE  
Manchester.....(603)668-1440

## SBE, Inc. (Continued)

NJ Industro Associates  
Newark.....(516)487-2620  
Trenton.....(516)487-2620  
NM RLS Instruments  
Albuquerque.....(505)265-4187  
NY Industro Associates  
New York City.....(516)487-2620  
NC Dixie Tech. Mktg.  
Mt. Airy.....(919)789-9759  
OH Applied Data Mgmt.  
Cincinnati.....(513)579-8108  
PA Applied Data Mgmt.  
Pittsburgh.....(513)579-8108  
SC Dixie Tech. Mktg.  
Columbia.....(919)789-9759  
TX RLS Instruments  
El Paso.....(505)265-4187  
WI Prairie Associates  
Waukesha.....(414)544-1141

## Scanbe, Div. of Zero

3445 Fletcher Ave.  
El Monte, CA 91731.....(213)579-2300

President: Robert Miller

## Sales Representatives:

AL Beacon Electronics  
Huntsville.....(205)881-5031  
AZ O'Donnel Associates  
Phoenix.....(602)274-6072  
CA McKinley Electronic Sales  
San Diego.....(714)271-7221  
Local Sales, Inc.  
Anaheim.....(714)956-1560  
(213)924-1691  
Taarcom, Inc.  
Sunnyvale.....(408)730-9595  
CO Component Sales, Inc.  
Denver.....(303)759-1666  
CT J.V. Electronics  
East Haven.....(203)469-2321

## Scanbe, Div. of Zero (Continued)

FL Beacon Electronics  
Clearwater.....(813)796-2378  
Ft. Lauderdale.....(305)491-1054  
Ft. Walton Beach.....(813)796-2378  
GA Beacon Electronics  
Atlanta.....(404)256-9640  
IL D. Dolin Sales  
Chicago.....(312)286-6200  
IN Electro Reps  
Indianapolis.....(317)255-4147  
MD Beacon/North, Inc.  
Randallstown.....(301)534-7200  
MA Stone Component Sales  
Framingham.....(617)875-3266  
MI Jack M. Thorpe Co.  
East Detroit.....(313)779-6363  
MN Gibb Electronic Sales  
Minnetonka.....(612)935-4600  
NJ MOS Associates  
Randolph.....(516)487-3966  
NM Fry-Gates Company  
Albuquerque.....(505)298-1875  
NY MOS Associates  
Great Neck.....(516)487-3966  
D.L. Eiss Associates, Inc.  
Rochester.....(716)328-3000  
Syracuse.....(315)457-0492  
Kingston.....(914)338-7588  
NC Beacon Electronics  
Greensboro.....(919)275-9997  
OH James Finnegan Co.  
Cleveland.....(216)238-5905  
OR Olson Ferree & Associates  
Hillsboro.....(503)640-9660  
PA Elf Sales, Inc.  
Prospect Park.....(215)534-3340  
TN Beacon Electronics  
Johnson City.....(615)282-2421  
TX Nova Marketing, Inc.  
Dallas.....(214)385-9669  
Houston.....(713)933-2636

Scanbe, Div. of Zero (Continued)

UT Component Sales, Inc.  
Salt Lake City.....(801)484-4222

VA Beacon/North, Inc.  
Falls Church.....(703)534-7200

WA Olson, Ferree & Associates  
Bellevue.....(206)883-7792

WI D. Dolin Sales  
Milwaukee.....(414)482-1111

Schneider Instrument Company

8115 Camargo Road  
Cincinnati, OH 45243.....(513)561-6803

Sales Contact: G. L. Schneider

Scientific Micro Systems, Inc.

77 E. Middlefield Road  
Mountain View, CA 94043.....(415)964-5700

President: Hugh J. Kern

Sales Contact: Jerry Tennant

Scion

12310 Pinecrest Road  
Reston, VA 22091.....(703)476-6100

Shugart Associates

475 Oakmead Parkway  
Sunnyvale, CA 94086.....(408)733-0100  
TWX: 910-339-9355

Sibthorp Systems, Inc.

800 Cox Avenue  
Erlanger, KY 41018.....(606)525-1300

President: Dr. R. J. Sibthorp

Sales Contact: Jeff Hanna

Sales Representatives:

CA Marketing Services Co.  
Orange.....(714)978-0721

IN Loren Green Associates  
Indianapolis.....(317)293-9827

MI Electro Sales Associates  
Livonia.....(313)474-7320

Sibthorp Systems, Inc. (Continued)

OH Electro Sales  
Dayton.....(513)426-5551

Cleveland.....(216)261-5440

PA Electro Sales  
Allison Park.....(412)487-3801

Single Board Solutions

24 Garden St.  
Redwood City, CA 94063.....(408)253-0181

Sky Computers

Foot of John St.  
Lowell, MA 01852.....(617)454-6200

Speech Plus, Inc.

461 N. Bernardo Ave.  
Mountain View, CA 94043.....(415)964-7023

Stynetic Systems

Flowerfield, Bldg. 1  
St. James, NY 11780.....(516)862-7670

Summagraphics Corporation

35 Brentwood Ave.  
Fairfield, CT 06430.....(203)384-1344  
TELEX: 964348

Systech Corporation

7630 Miramar Road  
San Diego, CA 92126.....(619)695-3420  
TELEX: ITT 499-0507 SYSTC

Sales Contact:

Sales Representatives:

AZ Peripherals, Inc.  
Phoenix.....(602)424-7800

CA Qualtech Associates  
Palo Alto.....(415)494-9060

North Hollywood.....(213)765-1419

Orange.....(714)639-9820

San Diego.....(619)274-8580

CO Eissler Sales & Services  
Littleton.....(303)794-1779

CT R. D. Stout Associates  
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Upper Darby, PA 19082.....(215)789-3820

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TWX: 710-826-0417

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Sales Contact: F. L. Hill

Vermont Microsystems, Inc.  
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Winooski, VT 05404.....(802)655-3800

Sales Contact: Greg Peters

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Sunnyvale, CA 94086.....(408)733-4200

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San Leandro, CA 94577.....(415)352-8971

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Ottawa, Ontario  
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TELEX: (851)847978

### Germany

Xylogics International  
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TELEX: (841)418397

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Sales Contact: Jim Banneck

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North Calif.....(415)828-3000

Qualtech Assoc.  
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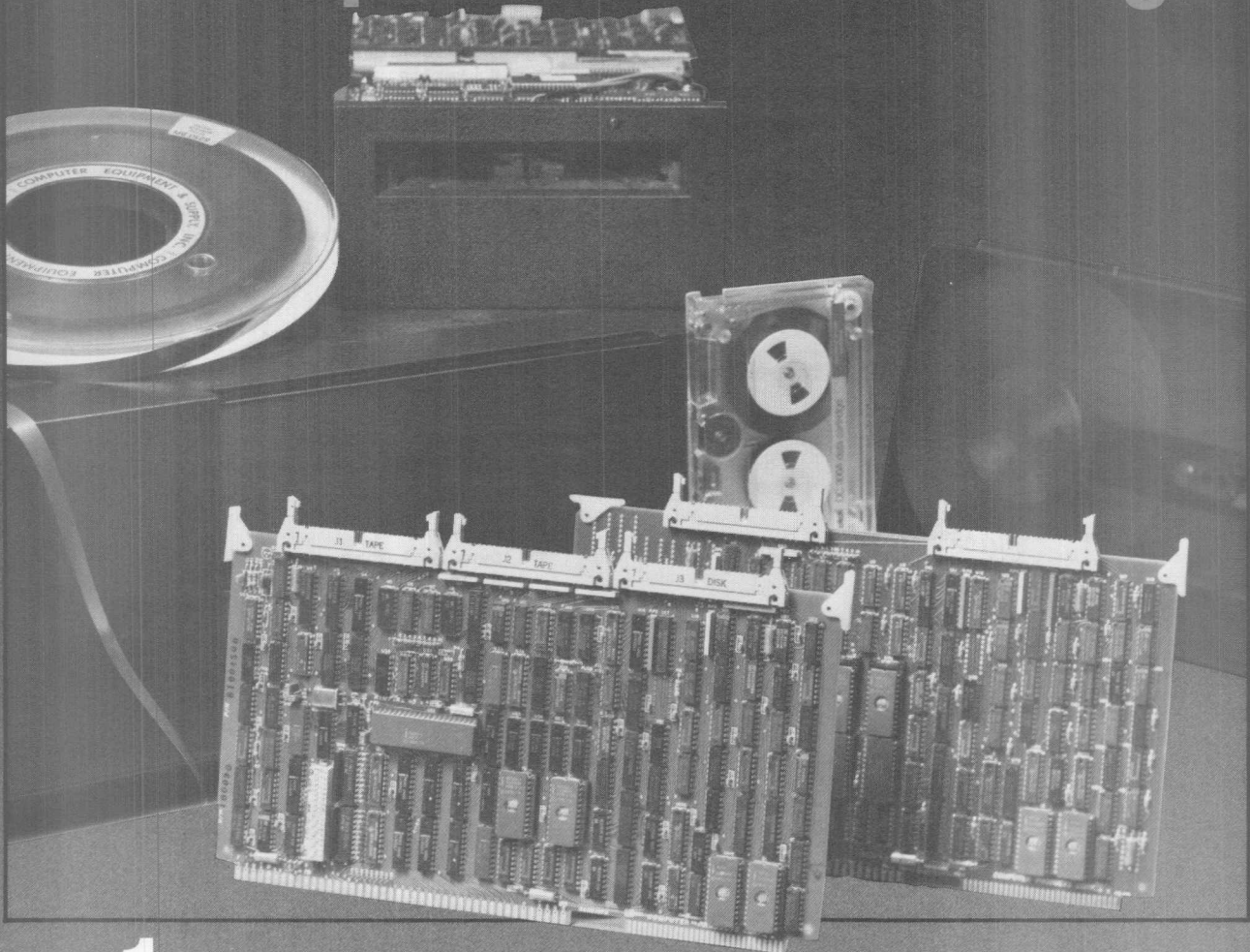
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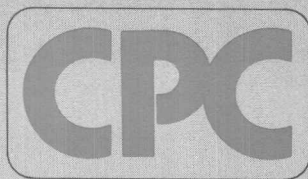


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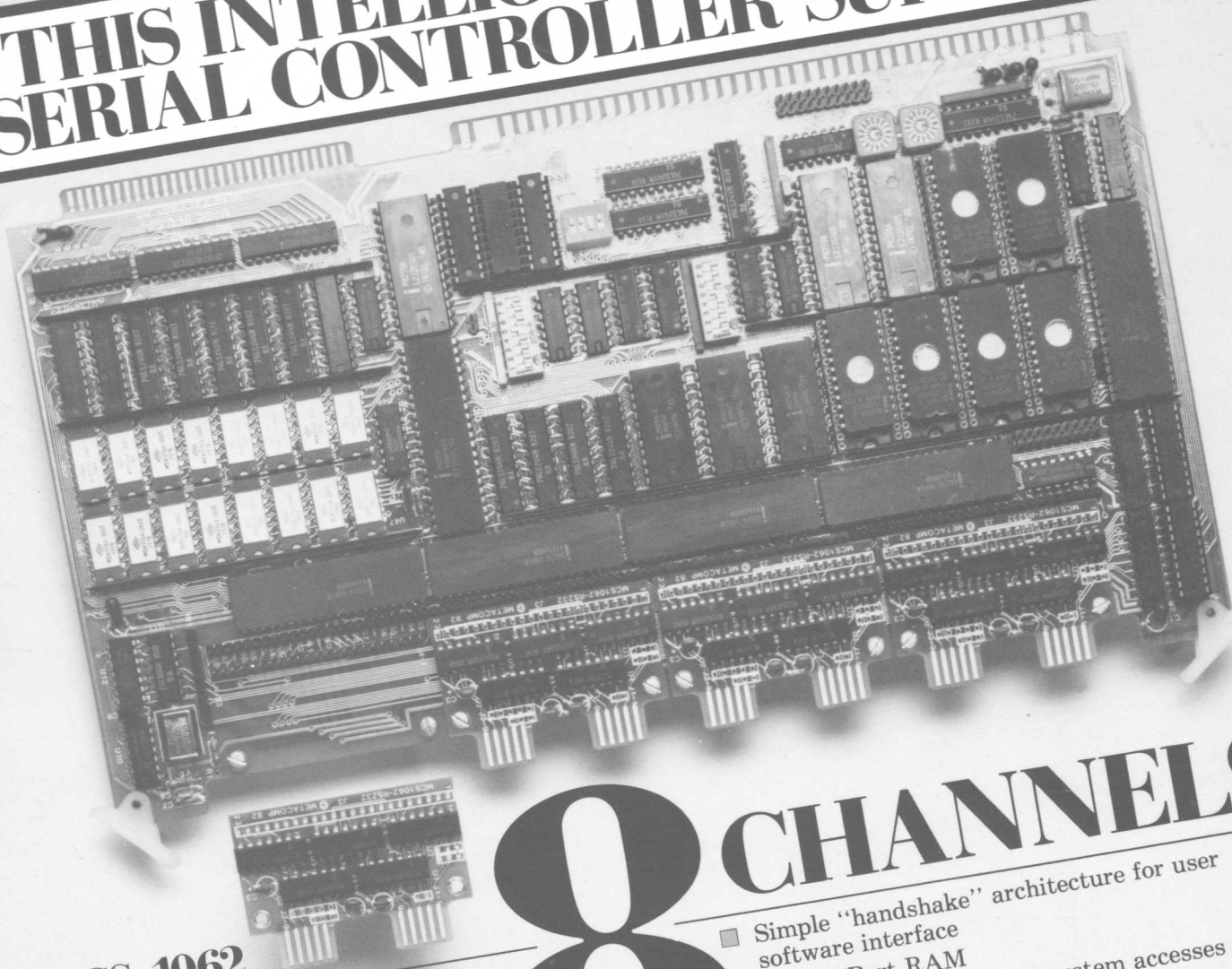
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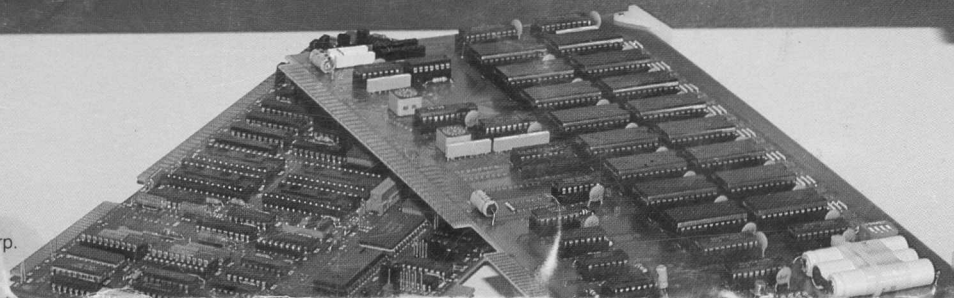
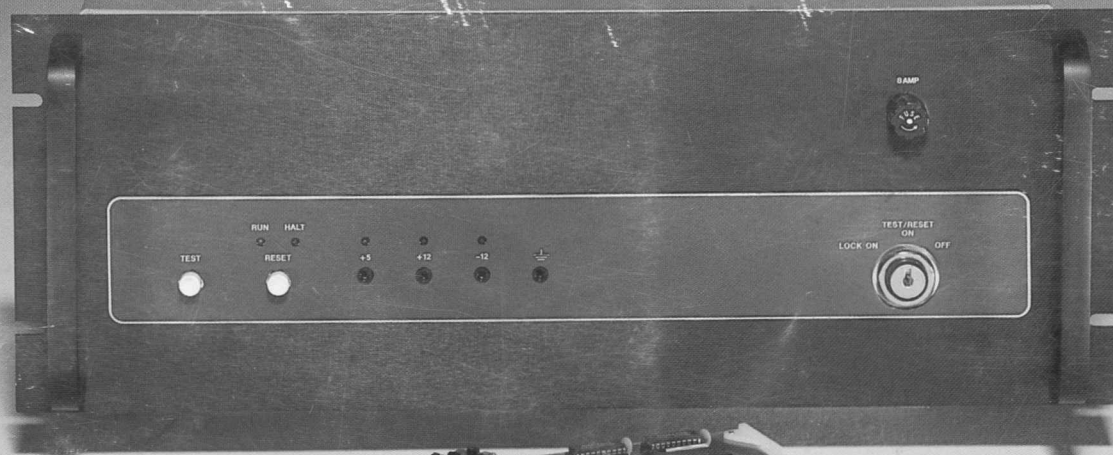
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